THE SURGICAL CLINICS OF JOHN B. MURPHY, M.D.

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VOLUME II *NUMBER 1*

THE SURGICAL CLINICS OF JOHN B. MURPHY, M.D.

AT

MERCY HOSPITAL, CHICAGO

FEBRUARY, 1913

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SURGICAL CLINICS
OF
Volume II JOHN B. MURPHY Number 1

OPEN TREATMENT OF FRACTURES

An Address and Operation

By Mr. W. Arbuthnott Lane, of London

At Dr. Murphy's Clinic, Saturday, November 23, 1912

Dr. Murphy: We are complimented and honored this morning by having with us one of the world's great surgeons, one of the men who has had the lime-light turned on him for many years, one of the men who is blazing the way in new fields, and one of the men who is suffering the vicissitudes that an explorer usually suffers. We know the criticism that has been heaped upon him for the especially prominent position he has taken in regard to bone surgery, and we know how well he has sustained himself under these trying ordeals. Gentlemen, I have the pleasure of presenting to you Mr. Lane, of London.

Mr. Lane: Gentlemen: Dr. Murphy is always so gracious, always so kind, always so generous. Of course, he has exaggerated, and, if I might use the term, ridiculously so, the few little things I have done. He is so good, so magnificent in everything he undertakes, that he likes to see others who are his friends getting along in the same way.

I think it would be best for me to read my paper. There have come to us recently, and for the first time, an enormous number of cases that deal with these bone conditions. For years we have been fighting that in London, but it is only recently that the work has been taken up by the medical societies. We are overwhelmed with a terrible number of disasters resulting from improper care of fractures, and we feel ashamed. Every day we get letters from doctors in the country telling us of the failures in their work, and that they are being sued for malpractice because of the results. But I cannot be held responsible for the ignorance and uncleanliness of others.

One day my head assistant telephoned me that a doctor had just brought in a case with four inches of the femur gone. He said

to me: "I told him that he must take the case back, that we did not want those kind of cases." I said, "No. Put him in the hospital and we will see what we can do." We put in an 18-inch plate, fastened it with large screws. That man is perfectly well. He has still three inches of shortening, but we could not help that. That is simply one of the many cases we get every day.

I will read to you what I have written, if you will permit.

GENTLEMEN: While I am fully conscious of the honor Dr. Murphy has done me in asking me to read a paper on the operative treatment of fractures before you, I quite recognize how difficult it is for me to say anything new on a subject which I seem to have worn threadbare long ago.

I was not led to resort to operative treatment from the observation of cases in the wards of the hospital where I found the surgeon had not only no knowledge whatever of the subsequent life-history of the patients he treated, but a ridiculously exaggerated or even quite an imaginary idea of the results of his treatment. I arrived at my conclusions from the study of the changes which the individual underwent in consequence of his leading a particular occupation. No subject can be more entrancing than the observation of the manner in which the skeleton alters with the mechanical relationship of the individual to his surroundings. Except for their comparative antiquity, I would refer you to certain papers * on the subject which illustrate evolution during a portion of the lifetime of the individual.

* "The Causation, Pathology and Physiology of Several of the Deformities which Develop During Young Life," Guy's Hospital Reports, 1886.

"An Important Factor in the Causation of Some of the Curves which Develop in Mollities Ossium and Osteitis Deformans," Journal of Anatomy and Physiology, October, 1887.

"A Remarkable Manner in which Pressure Changes in the Skeleton may Reveal the Labor History of the Individual," Journal of Anatomy and Physiology, April, 1887.

"Can the Existence of a Tendency to Change in the Form of the Skeleton of the Parent Result in the Actuality of that Change in the Offspring?" Journal of Anatomy and Physiology, January, 1888.

"The Anatomy and Physiology of the Shoemaker," Journal of Anatomy and Physiology, July, 1888.

"The Result Produced Upon the Muscles, Bones, and Ligaments by the Habitual Exercise of Excessive Strain," British Medical Journal, December 1, 1888.

Not only will they help the reader to grasp the mechanics of the skeleton, but they will enable him to understand the forces which determine the changes in the drainage scheme in civilization producing intestinal stasis, a subject infinitely more interesting and important than that of fractures.

The knowledge of general principles acquired in this manner gave me confidence to ignore the storm of indignation that the operative treatment of simple fractures burst upon me, and which continued to beat uninterruptedly until the surgeons of America took an active interest in the subject and threw the weight of their opinion into the balance. How completely public opinion has changed in England, and with what abruptness, is shown by the report of the Committee on the treatment of fractures, which was appointed two years ago by the British Medical Association when I opened a debate on this subject, at which Dr. J. B. Murphy was present.

The Committee, which was a very strong one, was demanded by the opponents of the treatment, who little expected that it would verify up to the hilt everything I had claimed for it. That report will be published in the British Medical Journal, November 30, 1912.

REPORT OF THE COMMITTEE TO THE BRITISH MEDICAL ASSOCIATION ON THE TREATMENT OF FRACTURES

The Committee was appointed by the Council of the British Medical Association in response to a recommendation to that effect by the Section of Surgery at the annual meeting of the Association held in July, 1910. The reference from the Council to the Committee was—"To report on the ultimate results obtained in the treatment of simple fractures with or without operation." The following are the members of the Committee: Mr. W. J. Greer, Newport, Mon., *Chairman;* Mr. J. Grant Andrew, Glasgow; Mr. Charles W. Cathcart, Edinburgh; Mr. H. S. Crogg, London; Mr. Edward Deanesly, Wolverhampton; Mr. C. H. Fagge, London; Sir Victor Horsley, F.R.S., London;

Prof. J. Rutherford Morison, Newcastle-on-Tyne; Mr. Herbert J. Paterson, London; Mr. P. W. G. Sargent, London; Mr. W. Taylor, Dublin; Mr. Wilford Trotter, London; Mr. Richard Warren, London; with the following *ex officio:* Prof. Robert Saundby, M.D., Birmingham, *President of the Association;* Dr. Ewen J. Maclean, Cardiff, *Chairman of Representative Meetings;* Dr. J. A. Macdonald, LL.D., Taunton, *Chairman of Council;* Dr. Edwin Rayner, Stockport, *Treasurer.* The Committee was appointed in February, 1911, and held its first meeting in March, 1911.

Note.—The full report of the Committee is published in the British Medical Journal of November 30, 1912.

CONCLUSIONS

The following are the main conclusions deduced from an analysis and full consideration by the Committee of the material collected by the Committee's investigators:

I. The statistics relative to the non-operative treatment of fractures of the shafts of the long bones in children (under the age of fifteen years), with the exception of fractures of both bones of the forearm, show, as a rule, a high percentage of good results. These are unlikely to be improved upon materially by any other method of treatment. Operative results in children expressed in percentages are approximately the same as the non-operative. The relative figures are:

Non-operative Cases (cases, 1017), 90.5 per cent. good functional results.

Operative Cases (cases, 64), 93.6 per cent. good functional results.

II. It is possible, either by non-operative or by operative treatment, to obtain a high percentage of good results in children.

III. In comparison with the non-operative results in children, the aggregate results of non-operative treatment in

those past childhood (*i. e.*, over the age of fifteen years) are not satisfactory.

IV. From the analysis of the age groups it is clear that there is a progressive depreciation of the functional result of non-operative treatment as age advances, that is to say, the older the patient, the worse the result.

V. In cases treated by immediate operation the deleterious influence of age upon the functional result is less marked.

VI. In nearly all age groups operative cases show a higher percentage of good results than non-operative cases.

VII. Although the functional result may be good with an indifferent anatomic result, the most certain way to obtain a good functional result is to secure a good anatomic result.

VIII. No method, whether non-operative or operative, which does not definitely promise a good anatomic result, should be accepted as the method of choice. For this reason mobilization and massage by themselves have not been found to secure a high percentage of good results. They are, however, valuable supplementary methods of treatment.

Similarly, of operative methods, those which secure reposition and absolute fixation of the fragments yield better results than methods which fall short of this; imperfect fixation of the fragments by wire or other suture has been found to be an unsatisfactory procedure in the treatment of fractures of the long bones, with the exception of the olecranon process of the ulna.

IX. Operative treatment should not be regarded as a method to be employed in consequence of the failure of non-operative measures, as the results of secondary operations compare very unfavorably with those of immediate operation.

In order to secure the most satisfactory results from operative treatment, it should be resorted to as soon after the accident as practicable.

X. It is necessary to insist that the operative treatment of fractures requires special skill and experience, and such facilities and surroundings as will insure asepsis. It is, therefore, not a method to be undertaken except by those who have constant practice and experience in such surgical procedures.

XI. A considerable proportion of the failures of operative treatment are due to infection of the wound, a possibility which may occur even with the best technic.

XII. The mortality directly due to the operative treatment of simple fractures of the long bones has been found to be so small that it cannot be urged as a sufficient reason against operative treatment.

XIII. For surgeons and practitioners who are unable to avail themselves of the operative method, the non-operative procedures are likely to remain for some time yet the more safe and serviceable.

When I started operating on simple fractures, I first made use of virgin silver wire to retain the fragments in accurate apposition, but about the end of 1894 I discarded it in favor of screws. I will quote a few lines from a paper * read before the Clinical Society of London on April 13, 1894, to illustrate my reasons for doing so.

"Now, as regards the best means of fixation of the fragments, in my earlier cases I used silver wire, but soon gave it up, as it was open to two great objections: First, as it is necessary to fasten its ends, it could only be passed in certain directions with safety, and to secure it satisfactorily one was at times obliged to incise the parts very freely. Secondly, one found that no amount of traction upon the ends of the wires would retain the surfaces of bone in accurate apposition after the grip of the lion forceps was relaxed. Therefore I decided to treat the bones as one would the broken leg of a table or chair. The surfaces were brought into accurate apposition and kept in their normal

* "A Mode of Treating Simple Oblique Fractures of the Tibia and Fibula More Efficient Than Those in Common Use."

relationship by strong forceps. Holes were drilled above and below the forceps and screws were driven in. The screws could be passed in any direction, and they retained their surfaces in an apposition more accurate and more forcible than I fancy can be obtained by any other mechanical arrangement. As far as I know, they cause no subsequent trouble."

As regards my reasons for operating on simple fractures, I have nothing to add to what I stated plainly in that paper, namely, that—

"Operative measures offer to the patient the following advantages:

"(*a*) They at once relieve the patient from the pain of any movement of the fragments upon one another.

"(*b*) They free him from the tension and discomfort due to the extensive extravasation of blood between and into the tissues.

"(*c*) They shorten the duration of the period during which he is incapacitated from work, since union is practically by first intention, and, consequently, very rapid and perfect.

"(*d*) Lastly, and by far the most important, they leave his skeletal mechanics in the condition in which they were before he sustained the injury."

During the last twenty years I have operated upon a very large number of recent fractures at all ages, from early infancy to extreme old age, with the same uniform success. I have employed various methods at different times, endeavoring to devise means of fixation of the fragments in accurate apposition which shall be at the same time effectual and easy of application. I soon recognized that if the treatment by open operation was to become general, it was necessary that the procedure should be rendered as uncomplicated as possible.

The difficulty that has beset this treatment is that, if a foreign body is left in a wound, the surgeon must be infinitely more careful about asepsis than he is in the ordinary course of events, and careful in a degree proportionate to the bulk of the foreign body. It is because of insufficient aseptic precautions and to some extent from a want of familiarity with the use of wire, screws, etc., that we hear of so many complaints of the development of rare-

fying osteitis about a screw or wire perforating a bone, of screws working loose and consequently becoming ineffective for the purpose for which they were employed, and of the employment of such futile methods as ivory pegs, etc.

With the exercise of greater cleanliness and with an increasing manual dexterity these troubles will cease to arise. Why a surgeon should not be governed by the same principles by which an ordinary skilled mechanic works I cannot understand, but I presume that the surgeon has rarely had any training such as would fit him for this kind of work. The opposition to operative procedures which continued with such intensity for so long has suddenly diminished, because the more progressive surgeons have broken loose from tradition and have satisfied themselves that by operation alone can the greatest measures of success be obtained.

I do not propose to discuss the various methods I have adopted for retaining the fragments immovably in accurate apposition, but will confine myself to describing those which I now find most effective for the purpose.

In deciding as to whether the surgeon should operate upon any particular fracture, or whether he should be satisfied to treat the case by manipulation, splints, massage, active and passive movements, etc., the importance or not of restoring the fractured bone or bones to their normal form should be the guide. It is obvious that if there is no displacement of fragments, or if the displacement can be overcome by manipulation, etc., no operation is required in the ordinary case. Till surgeons generally have improved their technique sufficiently, and have acquired a greater familiarity with the operative treatment of fractures, a varying degree of risk must necessarily accompany any open operation, and this danger has to be taken into consideration. However, if the surgeon is careful and familiar with these operations, and his assistants are efficient and reliable, there is no risk in the operation, and, unless the bone is too thin, too soft, or too much comminuted, he ought to be able to obtain a perfect result anatomically and functionally. Alcohol plays a very

important part in destroying the strength of the skeleton, by rendering the bones thin and fragile.

The surgeon must remember that the result of his treatment, whether operative or not, will probably be submitted to the test of radiography, and that a jury, instructed by counsel that our own creed teaches that the surgeon who has not placed the fragments in accurate apposition has not performed his work properly, are likely to regard any marked irregularity in the form of the bone as indicating a want of sufficient skill on the part of the surgeon, especially if such anatomic defect is associated with a marked loss of function. He must, therefore, be most careful in having fractures carefully *x*-rayed in planes crossing each other at right angles, so that any displacement may not escape his observation. A photograph in a single plane is not sufficient in the case of the long bones, however good it is. When a photograph cannot be obtained in several planes stereoscopic methods are very helpful. The details of the photograph should be carefully and clearly explained to the patient and to friends, and, whatever course of treatment is decided on, it would be advisable to obtain a written and witnessed acquiescence, so as to secure the medical attendant from subsequent loss, annoyance, and anxiety. To trust entirely to the now practically obsolete symptom called crepitus, and to an imaginary familiarity with the other clinical symptoms of fracture, is absurd in the present day, when every detail of any importance can be learnt by means of radiography, which is perfectly reliable in competent hands. In any case, the surgeon who does not insist on efficient radiograms being taken at the earliest moment in any suspicious case of injury renders himself liable to much criticism and financial loss in the future.

Perhaps the most awkward complications one may have to meet is fragility of the fragments, such as appears to exist to a great extent in alcoholics, and to a lesser degree in feeble children and in old age, and the softness of the bones in rickets. But this concerns the retention of the fragments in apposition rather than their reduction.

Delay in operating renders the replacement of the fragments more difficult, because the shortened soft parts or ties become

rapidly less extensible and a correspondingly greater force is required to stretch them. This is a serious matter if the bones are fragile or comminuted. Again, the ends of the fractured bone and especially the distal fragments undergo a process of rarefaction which is very rapid and very marked in early life. The rate of rarefaction varies inversely as the age of the patient, but progresses out of all proportion in the first few days or weeks of life. This rarefaction means an insecure hold for the screws, and must be taken into serious consideration. The operation should be undertaken as soon as the skin can be effectually cleansed.

The only change in my technic in the last nineteen years has been the substitution, except in certain fractures, as those of the neck of the femur, of flat steel plates which are united to the proximal compact layer of the bone by screws threaded up to the head, which in the adult bone perforate and hold only the proximal layer of compact tissue. Their substitution for the longer screw has facilitated enormously the treatment of these fractured bones by operation, and has placed in the hands of the many a ready means of effecting a very important operative procedure with perfect safety, providing they will grasp the fact that unless an asepsis is employed which is much more elaborate than that required for operations in which no large foreign body is left in the wound, the screws will act as foreign bodies and will cause necrosis at the point of insertion, which will require their removal, and the end-result of the operation will probably be much worse than if the patient had been treated by what are euphoniously called conservative methods.

If the surgeon hopes to succeed in the treatment of simple fractures by operation, he must insure an extreme condition of asepsis of the wound by excluding the skin of the patient from the area of the wound, which should be of sufficient length to allow of free and easy access to the seat of fracture.

He should never touch the wound with his gloved hand, nor with any portion of an instrument that has touched his glove, since gloves may have pin-hole apertures in them and they are readily torn in the use of the heavy apparatus requisite for handling the fragments.

He should recognize that the expenditure of very little energy is requisite to bring the fragments of bone into accurate apposition if proper means be employed to do so, and that the accurate coaptation of fragments is brought about by the exercise of manual dexterity rather than by brute force.

In the case of fracture by direct injury the ends of the bone are protruded from the wound and are coaptated by powerful forceps, the limb being extended simultaneously.

When the fracture is oblique or spiral, the fragments are moved on one another by the rotation of very powerful gripping forceps, and their movement may be enormously facilitated by the rotation of an elevator placed between the fragments. This moves the fragments on one another with an irresistible force at the expense of a very little energy.

Not the least difficult nor the least important part of the operation is the closure of the wound. The edges of the skin incision must be brought accurately together and must be retained very securely in apposition, since any separation of the edges of the skin may result in infection of the wound. For this purpose Michel's clips are found to be the most effectual. When there is no tension they are introduced easily, but where there is much swelling and inflammation their fixation is a matter of the greatest difficulty. In such cases it can only be accomplished by securing accurate coaptation by means of specially constructed tenaculum forceps introduced closely together. The clips are then fixed near one another in the intervals between the forceps, and when they have all been attached the strain upon them is so evenly distributed that the forceps can be safely removed without any separation of the edges of the incision.

It would be well for a surgeon who has had no previous experience of the operative treatment of fractures to telescope the difficulties which may arise by seeing how these operations are done by observing the procedure adopted by an operator who has had special training and experience in this form of surgery.

To read, as one does, of surgeons who do not regard the development of sinuses, necrosis of bone, etc., as evidence of infection seems absurd at the present time. If the surgeon has

the sense to recognize that these accidents are quite unjustifiable and are readily and certainly avoided with proper and efficient technic, he will soon cease to meet with them.

I cannot illustrate this latter better than by alluding to a paper* by Mr. Sampson in the Lancet, August 17, 1912, in which he shows that in not one of the 72 cases of simple fracture operated on by me at the Hospital for Sick Children was there the slightest evidence whatever of sepsis. He has spent much time and energy in the preparation of that paper and it will well repay perusal.

Where the surgeon will always experience anxiety is in operating on fractures of the upper extremity in the immediate vicinity of important nerve-trunks, and the situation of the incision and the mode of obtaining free access to the fragments may require much thought in devising it and skill in carrying it out.

Comminution of fragments may render an operation very difficult, and if associated with thinning and fragility of the compact bone, may put it beyond the pale of operative interference.

My experience in dealing with comminution when the density of the bone lends itself to operation is that it is usually wiser in the first instance to secure a sufficiently long steel plate to the lower fragment and then to connect the several loose fragments by small suitable plates to the lower piece. Later the lower fragment with the small pieces of bone secured to it and to one another can be fastened securely to the upper fragment by means of the long plate.

Do not hesitate to put plenty of metal into the wound, since it is exceedingly important that the fragments should be held together with sufficient security to permit of the movement of adjacent joints without endangering the junction in the least. This is particularly the case in the knee and in the joints of the foot and ankle, which readily stiffen if kept at rest for any time.

Also do not place a plate beneath the skin if it is possible to cover it up with muscle, but if it must be attached in this situation, take care that the skin incision is at some distance from it.

* "The Operative Treatment of Simple Fracture of the Long Bones in Children," by H. H. Sampson.

If a plate placed subcutaneously causes any annoyance after union has taken place between the fragments, it is as well to remove it before the man resumes any arduous occupation.

In the case of fractures through or in the vicinity of an epiphyseal line if the epiphysis cannot be restored accurately to its normal position by manipulation the fracture should be freely exposed and perfect apposition effected. A plate or screw is hardly ever requisite in these fractures, but if by chance one has to be used, it should be removed immediately union has taken place, so as to avoid any control of the growing line. It is well for the surgeon to remember in this relationship a law which I devised, namely, that "the rate of bone formation in the several parts of a growing line varies inversely as the pressure." In no circumstances in any fracture should the surgeon be satisfied with anything other than the perfect restoration of the broken bone to its normal form. There must be no compromise in this class of surgery.

The class of fracture that makes most demand on the skill and ingenuity of the surgeon is the badly united fracture, and this difficulty is increased if two bones are involved, and especially if a long interval has elapsed since the receipt of the fracture and if the subject be a child. These operations are very much more difficult and are accompanied with more risk from hemorrhage than are recent fractures. The results obtained are also very rarely as good, because of the changes which develop in the joints whose functions have been affected by the faulty junction. I think that with better initial treatment such cases will soon cease to exist.

Whatever the extent of the shortening in badly united fractures, the surgeon should endeavor to correct it entirely or to reduce it as much as possible. There is, as far as I am aware, no limit to which the muscles, nerves, vessels, etc., can be stretched if only sufficient force can be exerted on the fragments. Such operations may make a very great demand on the skill and resources of the surgeon, and an increasing familiarity with them will enable him to obtain an increased measure of success.

All these difficulties are accentuated by comminution which

may appear to make it impossible to establish continuity unless the limb be shortened very considerably, which in the case of the leg is not only a matter of physical importance, but affects very materially the esthetic aspect of the individual. This difficulty can be largely if not wholly overcome by the knowledge of a general law which I formulated, namely, that the skeleton represents the crystallization of lines of force which when exerted in one direction are laid down as compact tissue, when exerted in varying directions, as cancellous tissue.

Any alteration in a portion of the skeleton in the infant is followed by the formation of a new bone, the lines of force recrystallizing and the old bone outside the new lines of force is absorbed. The degree in which this takes place varies inversely with the age of the subject, and as age advances the crystallization, which is spoken of in surgical terms as callus, becomes limited more and more to the seat of fracture.

The same crystallization may be brought about late in life by engorging the part with blood. In this manner it is not necessary to bring the entire section of a shaft of a bone into accurate apposition, so sacrificing length of the limb, but if only a portion impacts the interval can be filled up by this means of overfeeding with blood.

In the case of the upper extremity this can be effected more readily by applying an elastic compress above the seat of fracture.

In the leg the same effect is best produced by attaching an apparatus by means of which the weight of the patient is transmitted from the tuber ischii to the splint beyond the foot.

Besides engorging the limb, such an apparatus enables the patient to walk about from an early period securing himself by two walking-sticks. You will find these modes of applying the general principle above alluded to most useful.

Perhaps the variety of recent fracture that causes the surgeons the greatest anxiety is the compound fracture, since he has to deal with the strong probability of infection. Personally, if I can obtain a reasonable approximation of fragments, I prefer to treat this form of fracture by splints or some similar fixation apparatus. If there were very definite sepsis, I would even prefer the frag-

ments uniting in a bad position to accepting the risk of introducing screws into a septic wound.

If, however, the fracture is of such a nature that much deformity may result and there is room for its application, I employ a very long steel plate with many perforations, and after obtaining accurate apposition of fragments, I fix it by screws at a considerable distance from the seat of fracture, so that if any necrosis takes place about the screws, it does not interfere with the texture and nutrition of the bone in the immediate vicinity of the fracture.

Of course, one's treatment of this form of fracture must vary largely with the locality of the fracture and with the degree of infection. It is well to remember that organisms will remain quiescent for a long time in a fracture which has united firmly and apparently normally, and that the subsequent introduction of screws may stimulate them into active growth and so endanger a junction.

[Here Mr. Lane showed a number of lantern-slides illustrating various forms of fractures treated by him, and the subsequent results, making running remarks on each case.—Ed.]

Fracture of Left Tibia

HISTORY

Patient, male, aged twenty-four, comes to hospital on account of malunion of both bones of left leg.

Seven weeks ago the patient was standing with his back against a pile of timber, helping to unload iron beams. One of these beams, 15 feet long, rolled from the pile and pinned his left leg against the lumber pile. He was held there by this beam for fully half an hour before he was released. He was unable to walk, and noticed a false joint in the middle of the leg. He was taken to a hospital and the leg was placed in a short splint. In six weeks he was sent home by the doctor, who said he was well. His friends were dissatisfied and sent him to another hospital. There is some motion at the point of fracture and a malposition of fragments.

The skiagram shows that both the tibia and fibula were fractured, with a small interposing fragment between the two larger fragments. There appears to be a weak bony union of the fibula, with displacement of the fragments. The tibia has not united at all, and there is a malposition of the fragments (see skiagrams).

Dr. Murphy: While Mr. Lane is preparing for the operation I will show you some of the work that has been done here. [Showing pictures and plates.]

Case 1 (Figs. 1, 2, and 3).—This case was originally not recognized as a fracture. The patient was told that it was simply a sprain of the hip-joint. The man was permitted to walk about. The first skiagram was made three weeks after the injury was sustained. That picture was examined by four good men. Three said it was not a fractured hip-joint, and one insisted that it was. The man was permitted to go to Europe. It was really a case of impacted fracture of the femoral neck. The skiagram shows that very distinctly. If you look at it more carefully you will see that there is a little displacement of the under margin of the distal fragment. We exposed the fracture, freshened the surface which had become eburnated from friction, and nailed the detached head to the shortened neck with three wire nails. That man recovered completely from the operation, had a bony union, as shown in the skiagram, and was sent home. Four or five days after reaching home he had an embolus of the superior mesenteric artery from which he died. If you examine the last skiagram you will see that the head is firmly approximated to the neck of the bone, and that there is already evidence of bone regeneration. This skiagram was taken about six weeks after the operation. This shows also that the shaft end was alive; in fact, at the operation we found that the detached head was still alive, getting its nourishment through the ligamentum teres.

In the first skiagram (Fig. 1) it will be noted that there is but very little shortening of the neck of the femur and not the slightest deviation in the angle. Four months later there appears a considerable absorption of the neck, and finally two years and four

Fig. 1.—A fracture of the anatomic neck of the femur, with considerable absorption of bone and separation of the fragments. The head is in the acetabulum. The shaft is displaced upward slightly.

Fig. 2.—Another view of the same case taken from a different angle. Fracture not apparent, although it seems as though there had been a fracture with impaction of the fragments.

Fig. 3.—The fragments were exposed and the ends freshened. Approximation was secured and maintained by means of three wire nails driven through the shaft into the head. One of these nails penetrated the acetabulum and aided in maintaining fixation. Leg is abducted.

Fig. 4.—Old fracture of anatomic neck of femur. Absorption of head of bone and non-union. Four months after operation. A portion of the greater trochanter was removed and nailed to the femur to make a new head. The result was perfect. A firm bony union took place, with restoration of function in the hip. Full motion in joint, even to the extent of crossing his legs.

months afterward the neck has absorbed completely clear out to the shaft, leaving only a button of bone in the acetabulum on an exact level with the epiphyseal line. It will be noted in the first picture that the fracture occurred near the epiphyseal line and that the absorption of the neck has taken place from within outward, which is the characteristic course for this absorption.

If the fracture had occurred near the trochanter in place of near the epiphyseal line of the hip, no absorption at all would have taken place. Looking over the skiagrams in the pathologic museum we can see that that has been the course of absorption for all time. In this case the various later skiagrams show the progress of the absorption toward the trochanters. If this limb has been completely immobilized in an abducted position, either by nailing or otherwise, primary union would have taken place without shortening and without bone absorption. It seems to me that the friction of the neck on the fragment of the head plays an important rôle in the absorption process, as well as the direction of the circulatory supply as accentuated in a paper I read before the Western Surgical Association about three years ago. The man was forty-eight years of age.

Case 2 (Fig. 4).—Here is another case. This man had a fracture of the anatomic neck of his femur and of his pelvis. The skiagram showed that the head of the bone had become completely absorbed. In this case we removed about four-fifths of the trochanter and nailed it to the neck of the bone from within outward with one wire nail to aid in regenerating the head. That man is an engineer and is back at work, which means that we got perfect results. He has splendid use of his leg. He can abduct, adduct, and circumduct it. He can cross that leg over the other and put his full weight on it. The transplanted trochanter filled in with new bone, which took on exactly the same size and shape as a normal femoral head. That gives you an idea of how a new head can be made from the trochanter. In fractures of the neck of the femur it takes a much longer time to get union of the head and neck than in an ordinary fracture.

These patients must be immobilized for twelve weeks in order to get the best results. In children it does not take so

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long, but the majority of these cases occur in people between fifty and fifty-five.

Case 3 (Figs. 5–9).—This case was one of fracture well up in the neck of the femur, with strangulation of the ligamentum teres and necrosis of the head. It was dead, but aseptic. We nailed back in place and a new head was regenerated. You can see the result in the skiagram made four years after the operation, showing how the head has regenerated and filled in with new bone. The epiphysis was not destroyed. Bone growth is taking place from it. This patient was sixteen years of age. We operated on him seven weeks after the injury. He has full use of his hip-joint, with only about ¾ inch of shortening. In fact, he has greater mobility in this hip than in the other. Even when he is walking rapidly he does not limp. It is now four years since the operation.

These are typical results. We dislike very much to do these operations in older people, but we are supported by the work Mr. Lane has been doing and in which he got such good results.

[Mr. Lane is ready to begin the operation.]

MR. LANE: Dr. Murphy has asked me to explain to you how I get these bones into apposition. It is easily done. There is absolutely no difficulty, because you simply grasp the leg between these two powerful bone-holding forceps so that both ends of the bone stick right out of the leg. Some one turns the leg and the fragments come into apposition. If you train yourself to do it with these instruments, instead of trying to do it with brute force, it is a very simple operation.

In the case of a fracture of the femur with four inches of shortening elevate the limb, the fragments are shoved out, as I did in this instance, and they come into apposition. Then put in a plate. I am very glad to do this operation, but Dr. Murphy would do it a thousand times better than I could.

OPERATION

MR. LANE: On exposing the bone, it was found that there was a displacement laterally of about one-half inch. It was fairly and firmly fixed with a considerable callus. The callus was

Fig. 5.—Fracture of neck of femur with separation of head, seven weeks after injury. Owing to separation of head from source of nourishment, it was dead but aseptic, so that it could be used to bring about the formation of a new head. The globular mass in the center of the picture is the head of the femur. The shaft extends behind and above it.

Fig. 6.—Head nailed to femur after reposition of fragments; beginning of regeneration of the new head.

Fig. 7.—Skiagram of same patient taken two and one-half years after operation, showing nails still in place and also the two phosphorus-bronze wire loops which were used to suture the muscle aponeurosis. Bony union complete. By comparing this skiagram with the previous skiagram, taken shortly after operation, it will be seen there is epiphyseal activity, and that the head of the bone is enlarging to meet the demands made by the growth of the patient.

Fig. 8.—Three months after operation patient was able to stand erect with both feet firmly planted on the ground and little evidence of shortening. Flexion was possible at right angles or 90 degrees.

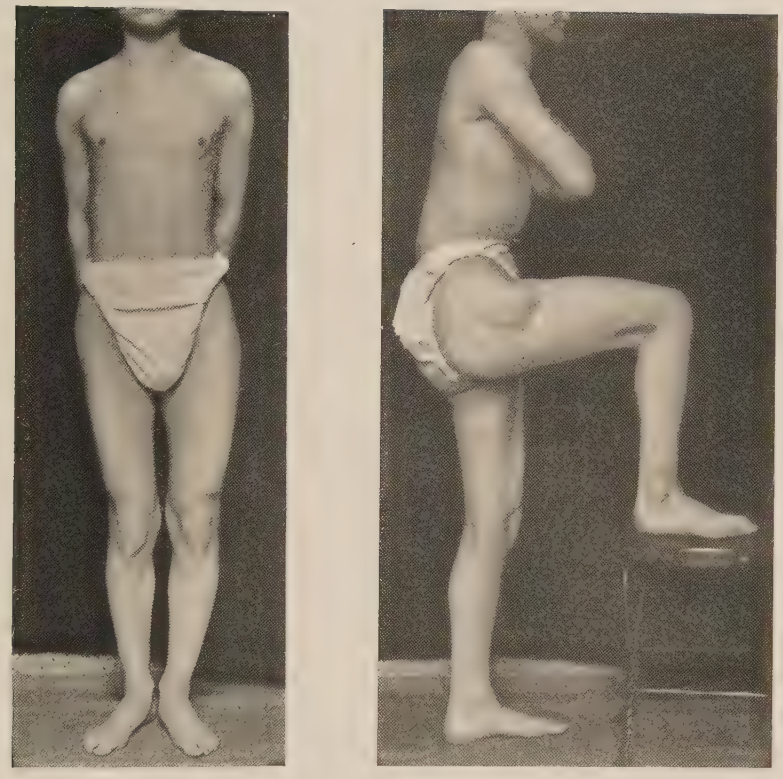

Fig. 9.—Two and one-half years after operation motion in hip-joint was normal—if anything, better than in the fellow-joint; even circumduction was full and easily done. There is a slight shortening of the leg of about three-fourths of an inch. When patient has shoe on he does not limp nor is shortening apparent.

first freed, and the line of fracture clearly demonstrated. Then it was depressed and then separated, and the ends of bone mobilized with a lion-jawed forceps. The ends of the bone were swung around into apposition and clamped there with our large clamp. The plate was slid under the clamp and attached and screwed to the lower fragment, and then screwed to the upper fragment, which brought about a most perfect apposition of the fractured ends of the bone. The screws and sponges used in the operation were never permitted to touch the hand or to touch any instrument which had touched the glove or the surface of the patient. The fact that no instrument that was touched by the hand was used insured the most perfect asepsis from the instrumentation and handling standpoint. This was accentuated as one of the most important factors in the operation, and unless exactions in detail in these particulars are attained and regularly attained, the operation will not be a success. I am not responsible for the defects of technic by others. No catgut ligatures were used and no catgut sutures. The skin was approximated with Michel clips.

Dr. Murphy: Do you put in muscle sutures?

Mr. Lane: No, nothing at all. The skin wound is closed with Michel skin clips.

Dr. Murphy: I am sure Mr. Lane will pardon my saying a few words on this operation. You can all see what has made his work in this line such a great success. In watching that operation, how many in this audience—and I know you are all able men—could handle all those instruments and never touch one of them with the gloved hand or allow it to come in contact with the edge of the wound? That is the secret of Mr. Lane's success. He is a past master of technic either in bone work or in abdominal surgery. He has learned how to use instruments, and never allow them to touch the wound. This case was a difficult reduction for two reasons, first, because of the position of the fragments, and, second, he did not have all the instruments he is accustomed to use at home. Notwithstanding these difficulties, he succeeded in putting those fragments into perfect apposition without touching the skin with an instrument or

glove. I noticed him many times sending back instruments which the assistants, well trained under me, had handled. They simply erred in carrying out Mr. Lane's technic. That is one of the things that must be understood, and one of the things that must be carried out properly if you are going to get results in this work. This work can be done by any skilled surgeon, but every detail of the operation must be mastered, and to get results it must be done by men who have trained themselves to do it.

You note that he does not make an apposition of the muscles with sutures, but he is making an apposition of the skin with the Michel clips. The apposition of those fragments was perfect. The small, almost detached fragment was held by only a small piece of periosteum. It did not matter to him whether he left that in or not, so great is his confidence in his asepsis. If that bone remains sterile, it does not matter whether it is contacting with periosteum or whether it is living or dead, it will be regenerated as long as it is contacting with living bone. You can see the perfect alinement of that bone now that the plate is in place.

Mr. Lane: Dr. Murphy makes me feel quite unhappy. I do not recognize my poor humble self in his beautiful description. It is nice to hear some one say beautiful things about you. I have been so much exposed to criticism that it is very nice that a man like Dr. Murphy, who can do bone work better than any man in the world, says such things about me.

Dr. Murphy (December 6, 1912): This is the patient that was operated on by Mr. Lane at the clinic November 23d, and today the dressings were removed and the Michel clips taken off. There was a complete and perfect primary union. The patient's temperature has never reached 100° F. at any time since the operation.

All of this, gentlemen, shows the effect of the superior aseptic technic carried out by Mr. Lane in the operation, even with strange assistants and in a strange operating-room. One had to see this operation in order to appreciate how all this work can be done by instrumentation and handless contacting of the tissues. We are all edified as well as educated by his work.

Fig. 10.—Fracture of tibia and fibula just below junction of middle and upper third, with upward and inward displacement of lower fragment of tibia. A small separate fragment can be seen between the main fragments of both bones (anteroposterior view).

Fig. 11.—Lateral view of same case with little apparent deformity.

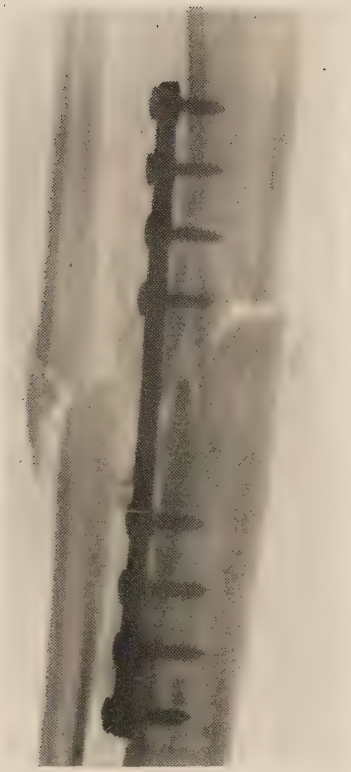

Fig. 12.—Anterior view after operation. The tibia only was splinted with an eight-screw Lane plate after both bones had been brought into alinement. The sequestra were not removed. The tibial sequestrum is firmly held against the main fragments by the bone plate.

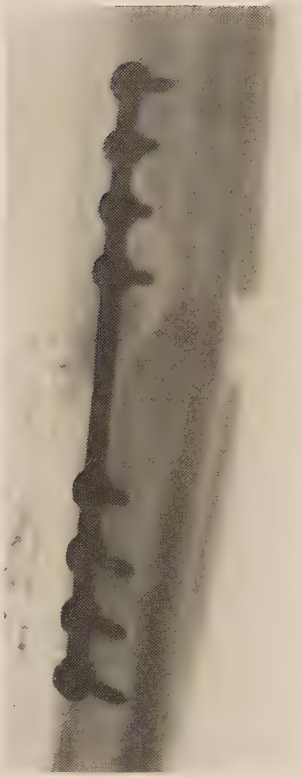

Fig. 13.—Lateral view of same case, showing perfect alinement of tibia.

OSTEITIS OF FEMUR

HISTORY

PATIENT, an unmarried female, aged thirty-two years, comes to hospital complaining of pains in left femur as a sequence to an acute osteomyelitis. Present trouble began when twelve years of age. On Sunday evening, September 10, 1892, she felt sick, had headache and general malaise. The next day she had several mild chills and that afternoon she complained of a severe acute pain over the lower end of the left femur, extending from just above, but not in, the knee-joint to the hip. That night she developed a high fever (?) and was delirious most of the time for two weeks. Does not remember how high her temperature was. Two days after the onset of the trouble her limb became swollen. The swelling increased in size, and opened of itself at the end of two weeks, discharging pus freely. As soon as the abscess opened the temperature dropped (?) and the pains became less severe. She does not remember having a sore throat, carious teeth, or any skin lesion at this time; no gastro-intestinal trouble and no vaginal discharge. In March following the onset an incision was made over the sinus above the external condyle, the wound was packed with gauze and allowed to heal by granulation. Was healed up in three months. A year later the sinus opened again and discharged pus. Bone was scraped, and wound allowed to granulate from the bottom. Remained healed for one and a half years, when it again broke open and a similar operation was performed. It then remained healed for nine years, but she had considerable pain in the winter season. At the end of this time it broke open again, and spicules of bone were discharged. After a short time the sinus closed again. Six months later she complained of a deep boring pain, worse at night, over the lower part of the femur. An operation was

performed, but she does not know exactly what was done. Since then she has always had more or less pain, worse at times, usually in the winter season, and sometimes requiring morphin to give her relief. Her knee-joint has never given her any trouble and is now freely movable.

Examination shows an old, non-adherent scar over the lower third of femur on the outer side; tenderness on percussion over lower half of femur. Patient is in good health otherwise. Heart and lungs normal. Menstrual history negative.

COMMENTS AND OPERATION

DR. MURPHY: What date was that?

THE INTERN: September 10th, twenty years ago.

DR. MURPHY: Think of that! Where did the pus escape? Where was the sinus?

THE INTERN: On the outer side of the lower end of the femur.

DR. MURPHY: How far from the knee?

THE INTERN: Two inches above the knee-joint.

DR. MURPHY: It remained healed how long?

THE INTERN: Nine years. The blood count is negative. White cells, 9800.

DR. MURPHY: Is it negative with a white-cell count of 9800? Is that negative? Not at all. Positive, and positively wrong, too. If she has that count for three days,—and the count should be made for three days,—when it is that way it is a matter of great importance. She has an infection here that has been present for twenty years, has it not?

THE INTERN: Yes, doctor.

DR. MURPHY: What's the matter with her? What is she here for?

THE INTERN: To get relief from the pain in her femur.

DR. MURPHY: Where?

THE INTERN: The lower third.

DR. MURPHY: How often has she this pain?

THE INTERN: It is constantly present and is worse in cold weather.

DR. MURPHY: She has periodic attacks of pain, and it gets

Fig. 14.—Osteitis of femur, with great thickening and hardening of the bone. Numerous small foci of infected granulation tissue were scattered throughout the external lateral aspect of the shaft, from the junction of the upper with the middle third downward, but not involving the knee-joint.

so bad that she has to have morphin. She had the recurrence of pain, and the pain was so severe that she had to have morphin to get relief. That tells the story. Now let us look at the skiagram. It does not give us any particular information. There is no evidence of a distinct, clean-cut abscess, but she has an osteitis extending the entire length of her femur. What kind of osteitis is it? Is it a tuberculous osteitis?

The next question that arises is, What was the matter with her originally? What was her original lesion? Did she have a tuberculosis or a pus infection in the metaphysis of the femur? The history tells the story. She got sick on a definite day. She did not get sick in September, but on the tenth of September. A tuberculous patient never gets sick on a definite day—never! It is three weeks and a half or six weeks from the onset of their inconvenience before they are incapacitated. They are inconvenienced before they are incapacitated, while in osteomyelitis they are incapacitated inside of twenty-four or forty-eight hours, and usually inside of twenty-four hours.

In making the incision I will follow the line of the old incision, keeping to the posterior margin of the quadriceps extensor muscle—the vastus externus portion of it. I will not cut the muscle-fibers at all—I separate them. I will go along in that fascial fold all the way. There is the most common position of resistance to pus in the femur, and by going in laterally I am keeping anterior to the external popliteal nerve. It is right under my finger. There is one thing you must always remember when you are doing work in this neighborhood, that if you disturb that external popliteal nerve you disturb all the muscles of the leg which it supplies. There is nothing to be seen in the skiagram that one could interpret as a definite circumscribed abscess. There is a diffuse enlargement of the femur, with probably many foci of granulation scattered along the entire length of the bone. The irregularity in the bone and the thickened periosteum are very apparent. That shows the nature of the disease in this case. There [indicating] is a large exostosis, larger than the others, meaning what? That there has been a focus of infection in the vicinity, and that it emptied

itself beneath the periosteum and started to produce an ossification in the muscle. Whenever you see this in the skiagram you know what has happened, and that it is not a periostitis, but an osteitis with a subperiosteal escape of infective products. That has been the greatest point of attack, the most common site of infection and of recurrence of infection. There was early destruction of the bone here. This particular spot is the triangular space between the heads of the gastrocnemius muscle. We will drill into the bone in several different places.

This is the hardest kind of work, because there is so much cicatricial tissue here. We have cicatricial bone, just as we have cicatricial tissue of the soft parts. The gray granulation tissue present here indicates that this is the chronic type of osteitis. That means that we will have to remove a great deal of bone. It is a severe type of osteitis from a pathologic standpoint, and a very discouraging one from a surgical standpoint—still more so from the patient's standpoint. We will remove all this granulation tissue and cicatricial tissue with the chisel. This bone is solid from periphery through to the center. It is not going to be soft until we get to the upper limit of the affected zone. The diseased spots in the bone are many, and they are the cause of her pain. Being surrounded by dense bone, the infective products cannot escape. That condition also causes this thickening of the bone and the change in its conformation. One sees the little pockets all through the bone and no medulla. This is a perfect picture of this type of lesion.

There is no central canal here. The bone is one solid mass. This disease burrows through the bone very much like a mole goes through the ground; it burrows out and burrows in, destroying the bone as it proceeds. I will drill down to the center of the bone. There is no disease focus there, and still when I follow that little red streak, which is the guide to the line of advancement, it leads to areas of bone destruction. There is a great deal of cicatricial bone here, but no infection at this time. No matter where I drill, the bone is hard, like an exostosis. This is exactly in consonance with the picture, showing that it is a subperipheral lesion of long standing, characterized by destruction and the

formation of new hard bone. We will remove all this débris with the sharp spoon. I kept well within the cicatricial line, hence there is practically no bleeding at all.

We have cleaned out all of the disease foci along about 10 inches of the length of the bone on its external lateral aspect. We will now swab the wound thoroughly with a 5 per cent. aqueous phenol solution, so as to render the field of operation as sterile as possible.

The aponeurosis of the quadriceps muscle will be firmly reunited with plain catgut. We need not fear the occurrence of a hernia of that muscle. I take out this cicatricial tissue because if I leave it here I am likely to have failure of union. The skin incision will be closed with horsehair. Now read that history again.

[The intern reads.]

DR. MURPHY: Pus was discharged where?

THE INTERN: Outside.

DR. MURPHY: Outside of what?

THE INTERN: From the lower third of the femur.

DR. MURPHY: All right, put that down.

[The intern reads.]

DR. MURPHY: Why did you say, doctor, that it was an acute infective osteomyelitis?

THE INTERN: On account of the suddenness of its onset.

DR. MURPHY: What do you mean by that? What are the symptoms of an acute infective osteomyelitis?

THE INTERN: A sudden chill after exposure.

DR. MURPHY: That onset is just the same as that of acute pneumonia. All right, give me the syndrome of symptoms.

THE INTERN: Exposure to cold, sudden chill, followed by pain.

DR. MURPHY: Give symptoms in the order of their appearance.

THE INTERN: Sudden onset of pain in the femur, followed by a chill.

DR. MURPHY: Where does it usually localize?

THE INTERN: At the end of the long bones.

DR. MURPHY: What do you mean by "in the long bones"?

THE INTERN: At the epiphysis.

DR. MURPHY: No, sir. Never in the epiphysis. You never have an acute infective osteomyelitis occurring in the epiphysis on the shaft side. What is the end of the shaft called near the epiphyseal line?

THE INTERN: The metaphysis.

DR. MURPHY: That's right. The pain is usually in the metaphysis. If you will read the literature of acute infective osteomyelitis in children, you will find that the regular name formerly given it in the English literature is acute epiphyseal infection of the bone. They do not differentiate between an infection that occurs in the epiphysis and an infection that occurs in the metaphysis. The metaphysis is the place where this infection occurs with the greatest frequency. It may occur in the shaft of the long bone, but only very rarely. The infection may spread from the metaphysis to the shaft. Within a few hours after its appearance in the upper end of the tibia it may extend to the lower end of the tibia, extending from one epiphyseal line to the other, and producing an acute infection of the medullary zone.

Let us analyze the symptoms as they occur, and let us see the pathology present. Remember, symptoms are only expressions of pathologic changes, and the interpretation of symptoms into their definite pathologic entities is the *Ultima Thule* in the practice of medicine. That is the most important and greatest achievement in the practice of medicine; that is, the interpretation of symptoms and signs into definite pathologic entities.

The first element in the etiology shows what ? The exposure or trauma. The following night the patient has a chill and then wakes up in the morning with a high temperature and has aches and pains. She tries to get up out of bed, but cannot on account of the pain in the lower extremities. The fever runs up to 103° to 105° F. following that chill. What comes next? Pain—severe pressure pain; a severe boring pain. It is in the neighborhood of a joint, not in the joint, and it is of a boring character. The patient is intensely ill. Go on, doctor.

THE INTERN: There are swelling of the limb and edema.

DR. MURPHY: When?

THE INTERN: The swelling usually comes on in a few days.

DR. MURPHY: When?

THE INTERN: After the onset of the pain.

DR. MURPHY: Yes. It is not an early symptom at all. The swelling is never present as an early manifestation—absolutely not. Why? Because the infection is confined within that unyielding bony wall, and the periosteum and the tissue outside of that are not infected. There is never a primary swelling. I will show you wherein that differs from metastatic infection in the joint. Ninety-five per cent. of the cases of acute infective osteomyelitis are diagnosed as "rheumatism." If you are going to do anything at all for that patient in a curative or preventive way, you should do it then, do it early, but, as a rule, during the early and important hours the patient is being treated for "rheumatism." Why? Because the pain occurs near a joint. Then you treat it as a metastatic synovitis because the trouble began with a chill, and we have learned that a synovitis associated with a chill is of a wicked type. What else?

THE INTERN: The leukocyte count.

DR. MURPHY: Yes. The leukocyte count is high. It usually runs up to 20,000, 30,000, and 40,000 because the medullary tissue in the bone is infected; the cancellous tissue is infected, and the products of infection are held in it under the highest possible tension. The pain is severe and continuous. The intoxication is great; the toxins get into the circulation, and the patient has a temperature of even 105° to 106° F. How long does this state of affairs continue—the high temperature and the pain?

THE INTERN: While the pus is under tension—until such time as it comes out of the bone.

DR. MURPHY: Yes. All right. Until such time as the pus comes out of the bone and spreads along the outer surface of the bone beneath the periosteum, and then for the first time there is local sensitiveness to superficial pressure. Go on, doctor. What next?

THE INTERN: Then the swelling.

DR. MURPHY: Yes. As soon as the pus ruptures through the periosteum into the cellular tissue, then the swelling appears; a phlegmon has formed and it will perforate through the skin sooner or later, and then the patient gets relief with the subsidence of his symptoms—the pain, the tenderness, and the high fever. Now, doctor, what about the neighboring joint?

THE INTERN: After exposure or trauma the patient has a sudden chill, followed by fever, with pain and localized pain.

DR. MURPHY: Where?

THE INTERN: In the joint infected.

DR. MURPHY: Go on, doctor.

THE INTERN: In metastatic arthritis there is limitation of motion—usually an ankylosis.

DR. MURPHY: We are not within six or eight weeks of that time. You cannot jump that span. What is happening all this time. We have considered only the initial symptoms of osteomyelitis up to the time when the pus burrows through the bone and appears beneath the periosteum. That gave us the external signs of the lesion and the tenderness. If the patient is young and the disease is in the tibia, after the pus gets under the periosteum it may travel from the knee to the ankle. It just lifts the periosteum up from the bone all the way; or it may travel from the knee to the ankle in the medulla. When it does, what happens? The circulation is cut off from that bone by the destruction of the medulla and elevation of the periosteum, and finally there occurs a necrosis of the entire shaft of the bone. If not complete, there is as much bone destroyed as is penetrated by the pus until the periosteum is lifted up from the bone and the pus makes its escape from beneath the periosteum into the cellular tissue. Sometimes it is just a portion of the metaphysis that is involved; sometimes it is a little round abscess; or it may involve the entire shaft; more commonly the entire shaft is involved in children rather than in adults, but still the entire shaft may be destroyed in adults as a result of an acute infective osteomyelitis. Why does the disease destroy the whole bone?

THE INTERN: Because the blood-supply is cut off.

DR. MURPHY: Why does it travel the full length of the bone within the medulla? The medulla is the least resistant part of the bone during the early stage. The infection extends from the medulla, and when it comes beneath the periosteum, it lifts up the periosteum. It makes space for itself in the medulla and under the periosteum. Why do I want to make that particularly impressive? Because that is the key to the treatment. If you know why you are doing things, it is no trouble to do them. How long a time is required for the entire shaft to be destroyed?

THE INTERN: Depending on the acuteness of the infection.

DR. MURPHY: What is the rule?

THE INTERN: Three or four days after the onset of the disease.

DR. MURPHY: Not so indefinite. The rule is for the maximum of destruction to be produced inside of seventy-two hours. The rule holds just as good here as it is to have the maximum degree of gangrene of the appendix produced inside of forty hours. Gangrene of the appendix rarely occurs after forty hours. If it does not occur then, the appendix is going to survive the infection without becoming gangrenous. In the acute infections of the bone the maximum of destruction generally is produced within seventy-two hours, and the major portion of that destruction has taken place in half that time—in thirty-six hours. What does that mean to us? It means that if we are going to be of the greatest benefit to the patient, we must do something before the end of thirty-six hours. That's what it means. It is the appendiceal proposition all over again. In connection with appendicitis we have learned that any case of appendicitis that goes on to the development of pus outside of the appendix has been mistreated. The gangrene is incontrovertible evidence of that, and no explanations avail. We have learned the lesson about appendicitis, but we have not learned the lesson so well about osteomyelitis. If we are going to benefit the patient, we must diagnose that osteomyelitis and do the things that are necessary to be done before the lapse of thirty-six

hours, or, better, before the lapse of twenty-four hours, and, still better, before the lapse of twelve hours.

Now let us go over the symptomatology and pathology of this infection. What has the pain to do with it? What has the chill to do with it? What is happening when the patient has a chill?

THE INTERN: The chill shows that there has been an infection in some other place in the body which has been metastasized in the bone.

DR. MURPHY: That is, when the microörganisms are circulating in the blood and are deposited in the medullary tissue of the bone and begin to multiply it causes a chill. The chill is the expression of the absorption of the products of infection, and it occurs very early. The elevation of temperature is the expression of the absorption of the products of infection and occurs very early in osteomyelitis because the pus is under such great tension. If that infection has been arrested in the metaphysis of the bone, what does it do after it is so arrested? It infiltrates the medullary tissue first, then gets into the Haversian canals and canaliculi, and then penetrates the bone lamellæ and that penetration and the toxic action of the microörganism produce a necrosis and death of the bone, because the infective products are held under tension.

What does the dentist do when a patient comes to him with a toothache? The moment the dentist touches that tooth he knows, no matter whether the patient has an elevation of temperature or not, that there is an infection at the root of that tooth. He drills into the tooth with a bur and relieves the tension caused by the confined infective products. As soon as the tension is relieved by a rupture of the periosteum and the exit of the infective products on the surface of the limb the absorption of toxins ceases and the pain subsides. That is what we must do if we wish to treat an acute infective osteomyelitis to the best possible advantage. We must release that infective focus in the bone and do it before the lapse of thirty-six hours.

I will cite an instance that occurred at a meeting of the American Surgical Association, which is the master surgical

association in this country. A doctor came to that meeting and brought with him seven shafts of long bones, trophies of what? Trophies of the most incompetent management of acute infective osteomyelitis. Why? Because if these infections had been vented early; if that infective focus in the bone had been opened early, there would be no shafts to display to the association; there would not have been any destruction of the shaft which crippled and permanently incapacitated the patients. All we need to do in these cases is to do exactly what the dentist does, cut down on the bone, and you need only a pocket instrument-case to do this, and bore a hole into the bone to relieve the patient of his symptoms and to save his bone from necrosis.

This case was not of the regular type. The infection stayed near the surface all the time and produced a gradual sclerosing osteitis. It was not a malignant type of infection. Whenever this infection reaches the periosteum she has the greatest pain. When it ruptures through the periosteum, she gets sensitiveness to pressure and edema and swelling. That clinical picture is classic of this disease, whether it is of the burrowing type or of the circumscribed abscess type.

The lesson we must learn from the clinical history of every case of acute infective osteomyelitis is that it begins with a chill; they have pain, indefinite in location, usually near a joint, never associated with an acute joint effusion, and therein you differentiate it from the arthritides called "rheumatism," or a metastatic arthritis, if you will. If you are going to be of real service to the patient, you must open that pus cavity inside of thirty-six hours and probably inside of twenty-four hours. You can make a differential diagnosis of the location of the pathologic process if you will carefully observe these symptoms, clinical course and physical signs, and you can avoid destruction of the bone, with the subsequent deformities of the limb and the ankylosis of the joint which occur so often following infection of this kind.

We will dress this wound with moist 5 per cent. phenol gauze. The next dressing will not be made before two weeks from now, when the stitches will be removed. Subsequent

dressings will be made at intervals of a week, or oftener if there is much discharge coming from the wound. We do not provide for drainage and we do not put on a plaster-of-Paris cast.

[This patient left the hospital nine weeks after the operation with the wound completely healed and free from all symptoms.—Ed.]

LUXATION OF SEMILUNAR CARTILAGE

HISTORY

PATIENT, a female, aged thirty-five years, comes to hospital on account of trouble in right knee-joint. June 6, 1911, while traveling on a train, her right limb "fell asleep." When she stood up, her knee "twisted," and she was immediately seized with an acute pain on the inner side of the knee-joint. Joint was locked, and only after considerable manipulating and rubbing could she move it again. She says she felt something "slip out of the joint as the pain came on." Two hours later, when she got off the train and was walking home, the same thing happened. Her knee was slightly swollen and painful for about two weeks. She did not use the limb during this time. July 11, 1911, as she was opening a trunk she heard something in her right knee-joint snap. Her knee became flexed, and she could not move it. She had to remain in bed three weeks. She had the knee massaged and hot dressings applied. After a time she could use it again. Since then she has had repeated attacks of locking and pain, but did not again feel anything slipping out of the joint. This knee is not so strong as the other, and she has pain in it almost continuously. There is tenderness on pressure over the internal semilunar cartilage, none over the external, with marked crepitation on moving the joint. Patient walks with a limp. Patella is not abnormal. Patient is otherwise healthy.

COMMENTS AND OPERATION

DR. MURPHY: She had repeated attacks of what?

THE INTERN: Of pain in and locking of the joint, but did not feel it snap.

DR. MURPHY: She could not hear it and feel it in the first attack. The doctor has that a little mixed. When the trouble

occurred on the train, she could not get her limb into a straight position until she endeavored to walk home, and then she heard a sound similar to the one she heard when it went out; after that she could walk.

She always had to walk with a cane. If she did not, the trouble kept recurring, and, as a result, she now has a chronic synovitis. The semilunar cartilages are more commonly fractured than luxated. They usually fracture on the edge and split into a fine web. You will recall an article written by Rutherford Morison, of Newcastle, who has a larger experience in this line of work than any other man in the world. He has 500 specimens of semilunar cartilages which he has removed. He practises in the coal districts of England, and it is very common for coal-miners to have luxation of the internal semilunar cartilage. When that happens they are at once taken to the hospital, and within a few days the semilunar cartilage is removed. In this country that accident occurs in an entirely different class of people. It occurs in athletes and those who play golf and baseball. It is either becoming more common, or we are paying more attention to it. There is scarcely a time in which we have not one or more of these cases in the hospital, showing how common it is when recognized. If it is not recognized and treated properly, there are baneful results to the joint.

When first the patient has this lesion he has pain and lameness, and finally gets a chronic synovitis. You can hear a crackling noise when the patient walks across the floor. Then comes the tendency to metastatic infection, called "rheumatoid arthritis," and many cases of "rheumatoid arthritis" of the knee are simply old cases of luxation of the semilunar cartilage which have produced a fibrous synovitis, and the patient is a semi-invalid all the time.

These evil results emphasize the necessity of doing something to relieve these patients. First immobilize the limb and put it in a plaster-of-Paris or a leather cast, and keep the leg in that cast for a number of months. Some of the patients recover; at least, they go many years without having a recurrence. But in a large percentage of them, when once it occurs, whenever they

put the limb in a certain position or in the same position as when the original luxation occurred, they have it again and again, and the palliative treatment is often kept up for two or three, or even four and five years. It is the uniform practice now to advise the removal of the cartilage. That involves a certain element of hazard, and the most serious hazard is the occurrence of infection in the joint. Fortunately, the hazard of infection is not so great as it would be if we opened a perfectly normal joint, because you have here a joint in a condition of chronic inflammation, and we know that in such a joint there is much less tendency to infection than where the conditions are normal and the tissues are not infiltrated, and the lymph-spaces coffer-dammed. In the early cases, unless there is considerable inflammatory reaction following the trauma to the cartilage, we aspirate and inject the joint with a 2 per cent. formalin in glycerin solution a week before the operation. In older cases we do not do that at all. Where we have a fracture of the patella the result of a severe trauma we do nothing at all. We just wait for a week or ten days until we know that the lymph-spaces in the tissues have been coffer-dammed; then we wire the patella. If, however, a patient fractures his patella as the result of his foot slipping and putting the patellar tendon on the stretch, we inject 10 or 20 c.c. of 2 per cent. solution of formalin in glycerin that has been mixed twenty-four hours, into the joint for the purpose of producing a reaction in the tissues which will coffer-dam the lymph-spaces. At the end of ten days all effusion will have subsided; then we open the joint and wire the patella. That very materially lessens the hazard of infection. Every one knows how much more difficult it is to infect a granulating wound than a fresh wound, and that is the basis on which these intra-articular injections are given.

One of the lesions that one can confound this with, without a careful examination, is an external luxation of the patella. These external luxations of the patella are not infrequent, and unless one studies the history of the case carefully and examines the patient thoroughly, a mistake in the diagnosis between these two conditions may be made. Perhaps you will recall a case we

had in this clinic last year. The patient gave a history very similar to this one. She had had a number of attacks. On questioning her, she said that her joint locked, and that after a certain movement it snapped, and she went on about her work. In examining the case, as I always do, I found it was not an internal semilunar cartilage luxation at all—it was a luxation of the patella.

In making the incision in these cases we begin about three-quarters of an inch inside of the inner margin of the patella, in a line with the patellar ligament, extending the incision down to the fibrous capsule of the joint. Remember, this capsule does not stretch—it is inelastic—it tears, but it does not stretch. The care with which one must do all his work in bone and joint surgery is in marked contrast to what can be done in the surgery of the peritoneum. All manipulation and touching of tissues with hands, sponges, or instruments must be avoided as much as possible. I think the one man who accentuates that more than any other in his work, if not in words, is Mr. Lane, of London. We never allow anything to touch these tissues that is not known to be absolutely sterile. Sponges are used only once. They are passed in and out at once. They are not allowed to come in contact with the skin or anything else during their passage to the wound. They are handled only with sterile forceps, never with the gloved hand. The instruments are handled in the same way. They are touched only where they are held to be of use. The service portion of the instrument is not allowed to come in contact with anything but the wound. Such technic as this obviates most, if not all, of the danger of infection.

I want to show you the two layers of this capsule. I am not through the synovial membrane at all. I have only cut the fibrous layer. See how nicely that can be picked up. Now I cut through the synovial membrane. The semilunar cartilage slips in and out of the joint without the slightest trouble. I can even lift it clear outside, showing how perfectly free it has been in the joint. That is a clean-cut case, one which shows the pathology of this condition much better than does the average case. There was no attachment at all of the semilunar cartilage on the central

side. That is the most mobile cartilage I have ever had. I succeeded in bringing out the whole circle of cartilage. That is not easy to do. The chronic inflammatory condition present here accounts for the grating mentioned by the patient.

The next thing to do is to suture the capsule. You will note that nothing touched that joint but my scissors and forceps. That is the key to success in the surgery of bones and joints. Now you can see that casts would not affect that condition at all, and that radical treatment was the only treatment that promised this girl any relief from her condition.

I will close the fibrous capsule very carefully with chromicized catgut sutures, so as to bring the synovial surfaces in contact. I have been careful not to abrade the synovial membrane, because if any of the lining endothelial cells are rubbed off, adhesions will form, and even a fibrous ankylosis may result.

Let the records show that the inner half of the semilunar cartilage was entirely detached, and that it was the outer half that was being traumatized. The outer half was slightly fixed. When she bent her knee in the superlative degree, the luxation occurred. She felt it snap and that threw it out. The skin incision is closed with horsehair and dusted with bismuth subiodid, a desiccating powder. It is not antiseptic.

VISITING DOCTOR: How is that leg dressed?

DR. MURPHY: It is dressed in a straight position, and placed in a wire cage—nothing else. We seal the wound with collodion gauze and put over that a 5 per cent. moist phenol gauze dressing. We have gone back to that dressing in all our joint and bone work, particularly bone work.

This patient will have a Buck's extension put on with 15 pounds weight attached. We do that in the case of every knee we open in order to prevent intra-articular pressure.

[The stitches were removed on the fourteenth day. Primary wound healing. The patient was discharged from the hospital after four weeks, with the knee in perfect condition, no pain, no tenderness, no swelling, and normal function.—ED.]

FLOATING CARTILAGE

HISTORY

PATIENT, a male, aged twenty-two years, comes to hospital on account of a loose body in the right knee-joint.

About the first week of January, 1912, he gave his knee a twist. He experienced a sudden sharp pain on the inside of the right knee, and a "buzzing" sensation in the joint. His knee did not become locked, and he was able to walk home. Two days later he noticed a swelling on the inner side of the knee. On palpating it he found that something slipped from beneath his fingers. The swelling soon subsided, but when he tried to walk, his knee became locked at every step and this body kept slipping in and out of the joint. Since then he has worn a tight bandage around the knee. This keeps the body in place, except when he is climbing stairs. The patient can find this body in the joint and push it out beneath the skin. Patient is in good health otherwise. He does not remember injuring this joint or having inflammatory trouble of any kind before the present trouble started.

COMMENTS AND OPERATION

DR. MURPHY: This is a floating cartilage and not a fractured cartilage. There are essentially three varieties of floating joint cartilages. First, there is the accretion cartilage, which begins as a separation of a fold of the serous membrane or a small fragment. That is the type we have here today. Second, a fragment of cartilage of considerable size is torn loose in the joint and floats about, but does not increase in size. Third, an attached portion, either of the synovial membrane or of the fibrous tissue, becomes traumatized in the joint and increases in size, but remains attached. It swings around in the joint and

acts as a floating body. These are the three types of floating cartilage. They are all different from the type of luxated semilunar cartilage or fractured semilunar cartilage because a fractured semilunar cartilage, which is enormously more common than the luxated cartilage, is always attached at the central or peripheral zone.

You will remember the case we had a week ago today. A young lady was sitting down on her heel, when suddenly she was seized with pain in her knee-joint and it became swollen. You will remember in that case the internal semilunar cartilage was entirely detached on the central side and I could swing it in and out of the joint. A dislocated internal semilunar cartilage is enormously more common than we imagine. It causes a great deal of destruction to the joint. It causes a hyperplasia of the capsule, and the condition resembles a rheumatoid arthritis. The joint is incapacitated by the traumatic inflammation that occurs within it. The lesson we learn is this: When the cartilage once commences to be luxated, if the patient is fairly active there is but one line of treatment that is effective and safe, and that is the removal of the internal semilunar cartilage. The internal semilunar cartilage gets displaced fifty times to one displacement of the external cartilage. This statement is based on the experience of Rutherford Morison, of Leeds, England. He has had the largest experience in that line of any man in the world. He lives in the coal district, where the miners work in a stooping position, in low shafts, and that throws that cartilage out very frequently. The moment a workingman in the coal-mines in Newcastle has that type of injury, he is taken to the hospital, the joint is opened, and the internal semilunar cartilage is removed. Inside of three weeks he is at work again. The first able paper on this subject was written by Edmund Owen, of London. His patients were athletes. He put on casts and the patient would be relieved, but the condition recurred again and again, differing entirely from Rutherford Morison's experience, who thinks nothing of opening a joint, because he is so familiar with the work and is so dextrous that he does not infect the joint.

Fig. 15.—Internal semilunar cartilage removed in its entirety, showing thickening of one edge.

I have had the cartilage in this case out half a dozen times. Never cut down on that until you are able to locate it definitely, because you will otherwise traumatize the joint. In the management of these cases simply open the joint, remove the cartilage, and close the capsule with chromicized catgut. Only a small incision need be made directly over the foreign body. Grasp it firmly through the skin with finger and thumb, and then make the incision directly over it.

The application of ambulatory apparatus is deceptive to the doctor and to the patient; they have no real value, and it is not the treatment for this lesion. The right treatment is the removal of the cartilage, because if allowed to remain it keeps up a continual inflammation in the joint. This is the typical accretion variety of floating cartilage.

In suturing that capsule I include the synovial membrane in the suture. We will have no traumatic inflammation in this case. We did not touch a thing in that joint. We split the capsule, brought out the cartilage, and closed the incision in the capsule. We respect that joint. Neither sponge nor instrument touches the synovial membrane. A few horsehair sutures close the skin incision. Bismuth subiodid powder is dusted on it, and collodion gauze seals it. A 5 per cent. moist phenol gauze dressing is then put on. No cast and no extension.

I will bisect what we have removed and see what its construction is on the inside. The accretion type often is ossific in its center. This specimen is cartilage through and through. It is of typical accretion variety.

[The stitches were removed on the tenth day. Primary healing. Patient discharged from hospital in two weeks.—Ed.]

FECAL FISTULA FOLLOWING APPENDECTOMY

HISTORY

PATIENT, a little girl ten years of age, comes to hospital on account of a fecal fistula in appendicular region.

July 13, 1912, the patient was operated on for acute appendicitis of three days' standing. The appendix was found perforated. The wound was closed. Three weeks later there was a large collection of pus in the peritoneal cavity. A large drainage-tube was put in through an incision in the left iliac fossa, and brought out through an incision on the right side. A quantity of pus discharged. After four weeks the tube was removed, the left side healed up, but a fecal fistula formed on the right side. Since then the contents of the bowel have come through this opening. At present there is an opening in the abdominal wall the size of a silver dollar, where the drainage-tube had been. Through this opening the mucous membrane of the large bowel herniates. The hernia disappears within the abdomen when the patient lies down and retracts the abdominal wall. There is a high-grade dermatitis all around the opening. The mucous membrane that herniates through this opening is red and granular on the surface. Patient is in good health otherwise.

COMMENTS AND OPERATION

DR. MURPHY: When was the pus discovered in the peritoneal cavity?

THE INTERN: Three weeks after the wound was closed.

DR. MURPHY: On what day of the attack of appendicitis was she operated on?

THE INTERN: On the third day.

DR. MURPHY: Are you sure about that? Was it the third or fourth or fifth day?

THE INTERN: It was the third day, she says.

DR. MURPHY: What you want to ascertain is, was she operated on the first or second day. At that time there should be no pus outside of the appendix, and the closure of the wound was the proper thing. I received a reprint a few days ago in which the author speaks of the desirability of closing the peritoneal cavity immediately, even when there is pus present. He does not, however, make a differentiation between the various kinds of pus—between the protective or defensive pus and the offensive pus. We all know that long before there is a perforation of the appendix, early in the attack there is a large quantity of milky material in the peritoneal cavity which we call pus, but which we know is absolutely innocuous. It is a defensive material, filled with polymorphonuclear leukocytes, which give it the milky appearance. It is there for protective purposes. If the same quantity of pus is present on the third day after a perforation of the appendix, we would have an entirely different proposition to deal with. The doctor who wrote the article in question did not make that differentiation, and one should make that differentiation because we have exactly the same conditions to deal with here as in a perforation of the alimentary tract, or the pus of an old pus-tube, which, we know and have known for many years, is sterile, and which permitted Mr. Tait to make such splendid demonstrations to the English medical profession in the way of going in and taking out pus-tubes and letting large quantities of pus get all over everything.

This patient was not operated on in the pre-suppurative stage; in other words, it was not a timely operation—and what is a timely operation? It is the operation that gets that appendix out in the acute stage before the infection has passed beyond its wall. Every case of appendicitis that is allowed to go on to the stage of perforation is irrefutable evidence of bad medical management or that the patient or the patient's family delayed too long in accepting the doctor's advice to operate. All this has nothing to do with this case, except to bring out the fact that

Fig. 16.—Hernia of the cecum. Extruded. Lumen of bowel barely visible in center of mass.

Fig. 17.—Hernia of the cecum reduced voluntarily by forced retraction of the abdominal wall. Severe degree of dermatitis all around the fistulous opening.

the operation was not done as early as it should have been done. When the patient was operated on there was some pus present, but it was believed that the pus was not virulent and the wound was closed.

There is now an ectropion of the mucosa of the cecum, not the intestine running in and out, and the part that has lost its gloss is the mucosa, not the peritoneal covering. It is firmly adherent around the margin of the opening in the abdominal wall, and the ileum presses forward under the cecum and everts its mucosa through a comparatively small opening. These cases are very difficult cases to handle—difficult, first, because we have the abdominal wall to close, and, second, there is a large opening in the large intestine which, on its posterior half, at least, has no serous covering, which means that we will not primarily have agglutination of the serous surfaces when we make the suture. It is further difficult to manage because we have an infected field to work in. For this reason not infrequently there is failure of union at the line of suture.

It is my belief that we can free the intestine along the line of adhesion and get a good place to put in our sutures. We will have to put in at least three rows of sutures, the first two rows being of Pagenstecher linen, and the outer one of plain catgut, because in all probability the wound will be infected. We will not close the wound without drainage because of the dermatitis which has been present for such a long period of time.

The management of an intestinal fistula is not an easy matter at all. It is a very difficult problem. An operation for intestinal fistula is one of the most serious operations, and in proceeding to attack an intestinal fistula you must have a well-outlined definite plan of procedure in mind. The first proposition is that you must expose the opening into the intestine. The second proposition is that you must free the intestinal wall from all the attachments in the neighborhood. It must be perfectly free. You cannot make a line of suture and leave the intestine attached to within half an inch of the line of suture. If you do, it will be a failure every single time. The intestine must be free and completely free from the abdominal wall, so that you

can lift it out into the field if you so desire. Then, after it is out, insert your lines of suture; and where you have the large intestine to deal with and no peritoneum, it is very desirable to sew an omentum flap over the line of suture.

That is an unpleasant field to work in, and that is why we fear failure of union. This child is very expert in the handling of this hernia. As she strains she can force the bowel away out, and when she draws it in, you can look into the cecum. We can see the ileocecal valve. It is not pressed out far enough this morning. Yesterday she had it out so that one could see the ileocecal valve.

We will not disinfect the field of operation with a 3.5 per cent. tincture of iodin, as is our usual custom in this clinic. We use only sterile water and alcohol, because of the dermatitis present here. We have found that the full strength—7 per cent.—tincture of iodin occasionally causes a dermatitis, especially in patients susceptible to the irritant action of iodin. Therefore we use a 50 per cent. dilution or a 3.5 per cent. tincture.

The dry skin is painted with that just before the anesthetic is begun. Then it is covered with a sterile towel. The field is then ready for the operation.

I am going to endeavor, first, to detach this bowel from the abdominal wall, just at the margin of the mucosa. There is the free peritoneal cavity now underneath, not open, but you can see the peritoneum rise and fall. We must be exceedingly careful in freeing this bowel from its adhesions. We will first free the mucosa, so as not to open the peritoneal cavity. Now I have this mucosa ready for closure, using a straight needle threaded with Pagenstecher linen. I have no trouble in making an entropion of that cut edge of the mucosa. Now I have all that raw surface of mucosa turned into the bowel and the bowel is closed.

The next step is to open the peritoneal cavity and detach the remainder of the intestine from its fixation. This is done with less difficulty than we experienced in freeing the mucosa. Now we commence to pull up the intestine. There is the free peritoneal cavity. Now we have the lower side fairly well freed.

We come along now on the outer side, where we expect to have no peritoneum, and free that adhesion. That is what I mean by freeing the intestine from its fixation to the margin of the fistula. Now the intestine is perfectly free. There is the part of the intestine that has no peritoneum on it. It shows there very nicely. Now we will put in two rows of so-called Lembert stitches, but we have no serosa.

VISITING DOCTOR: Was that first stitch linen?

DR. MURPHY: The first row of stitches was linen and the second is also linen. The third will be a catgut stitch.

This is the peritoneum you see quite a little distance back. This fatty tissue in here, which gets its vascularization from above, we will not interfere with at all further than to free it and permit me to get a better line of overlapping. The weakest point in every gastro-intestinal anastomosis is the angle. If you go over the literature of gastro-intestinal approximation, you will find that Billroth and Wölfler had their trouble with the mesenteric angle. The temptation is very great to close that wound without a drainage-tube, but you remember we learned when we were young to "yield not to temptation." We therefore put in a rubber drainage-tube external to the cecum and passing downward. I am getting my muscular flap ready, and I am going to make it of the overlapping type. All that work is practically done extraperitoneally.

There is the aponeurosis now of the external oblique muscle in the field. I am making my imbrication of the muscle-flap now, using catgut for my suture material.

The greatest danger of infection is going to be right in this cellular tissue. Cellular tissue does not resist contact with colon bacilli. It resists other microörganisms very well, but not colon bacilli. All the knots are placed on the outside. Lysol and phenol are the best germicides for the colon bacillus.

Let the record show that the sponges have been counted and found correct. We had no sponges in the abdominal cavity, but nevertheless they are counted as if we had a dozen in the peritoneal cavity.

We use the figure-of-8 suture of silkworm-gut, just the same

as we do in all our laparotomies. We are getting normal skin for this union in place of the cicatricial skin. The skin is closed with horsehair.

Let the record show further that after cleansing the field, the patient was placed in the upright position, and it was easy to invert the mucosa of the cecum. When this was completed, the margin of the mucous membrane of the cecum was entirely detached from the skin, and the margin of the cecum from the fibrous tissue of the muscular wall. As soon as that was fairly free, an entropion stitch of Pagenstecher linen was made, turning in the divided edge of the mucosa of the cecum. When this was completed, the cecum was freed from all its parietal attachments for a distance of two inches on the external side and perfectly freed on the internal side. Then two additional rows of Pagenstecher linen sutures were made, approximating the muscularis of the intestine. The fascial attachments and adherent omentum were entirely freed, so that the muscularis came into view.

When this was completed, a drainage-tube was placed external to the cecum and extending out into the connective tissue, that is, on the outer side of the cecum, and passing it to the pelvic or iliac floor. There is practically no tension on the skin. Horsehair has maintained the apposition. The drainage-tube was secured by a safety-pin, and with a silkworm-gut fixation suture. Bismuth subiodid will take up the secretion from the skin, if there is any, or it will form a cement with that secretion and seal the wound. It is better than collodion.

That is the uniform technic in the management of all external intestinal fistulas. First, get that bowel opening freed from the abdominal wall; second, close it; third, free the bowel from its attachment to the abdominal wall; fourth, put in the additional rows of suture that are necessary for the approximation; fifth, provide for drainage, if necessary. Suppose that was a cavity down in the pelvis and you have several loops of intestine coming in: First, open the peritoneum around the sinus, and then go wide to where you have free peritoneum and detach the bowel from the anterior abdominal wall, no matter whether it is the sigmoid or the upper portion of the rectum. Occasionally, in

the upper portion of the rectum, for instance, where there is a suppurating dermoid that opens into the rectum and the fistula is located at that fold where the peritoneum turns forward from the rectum onto the uterus, where you cannot get sufficient freedom to make an inversion, you frequently have failure of union. Free it on all sides as far as you can, one-third of each side, and get a good approximation, and make a turning in, if possible. If you cannot make a turning in, put in stitches one after another, including the posterior surface of the uterus and suture the uterus down on the hole. I have done that a number of times with success. In that case always put in a rectal tube so that there is no tension during the process of repair. The tube should be kept in three weeks, so that there will be a free escape of gas and feces.

The worst class of cases encountered in this connection is the class associated with tuberculosis of the intestines. In that class of cases you always have danger of failure of union of the intestinal wall. If the fistula is large and the bowel is fixed and the tuberculosis is circumscribed, there is another route you can follow: You can detach the ileum from the colon, and reattach it to the colon higher up, entirely out of the tuberculous zone, making either an end-to-end or side-to-side anastomosis into the ascending colon, some distance above the cecum. Close the end of the cecum. Then you have simply a tuberculous cecum or a tuberculous pocket. Fatten up the patient until his tuberculosis is overcome, and then make an excision, but do not try to make the excision primarily, because if you do you will lose your patient. As a rule, you will get infection of the field, and, furthermore, you will not get union if you are close to the tuberculous zone.

[This patient made a rapid convalescence from the operation. The tube was removed within a week, and the wound closed promptly. The patient left the hospital in four weeks and reported a week later that she was feeling fine and was entirely well. Her doctor stated that her bowels were moving naturally, and that there was no evidence of any trouble in the right iliac fossa. Later word was received from patient that she was entirely well; no hernia; no weakness of abdominal wall.—Ed.]

MEDICOLEGAL RELATIONS OF PHYSICIAN AND PATIENT

Dr. W. C. Woodward
Health Officer of the District of Columbia

Address delivered at Dr. Murphy's Clinic, October 21, 1912

Dr. Murphy: We are fortunate and favored in having with us today a man who has had institutional training and great experience. He has been health officer of Washington, D. C., for about eighteen years, and prior to that served as coroner. In addition he is professor of medical jurisprudence in Georgetown and George Washington Universities; in the former, professor of medical jurisprudence in the legal as well as in the medical department. He had his early training in medicine and later took up the study of law. I have the pleasure of presenting to you Dr. Woodward, of Washington, D. C., who will talk to you on the subject of the Medicolegal Relations of Physician and Patient.

Dr. Woodward: *Gentlemen:* The subject I have selected to talk upon this morning is one to which too little importance is ordinarily attached in medical schools. The physician passes through his course in medicine, takes his diploma, obtains his State license, and begins to practise. That he has a definite legal responsibility to his patient does not often occur to him unless difficulty occurs in collecting some contested bill from a patient or from a deceased patient's estate. Or, possibly, he gets his first insight into the legal relations of patients and physicians through a malpractice suit instituted against him. A physician can evade the responsibilities of general practice. He may decline to take a case of obstetrics. He may limit his field of activities to surgery and decline to take medical cases. He can evade responsibility concerning practically everything in relation to the patient, except with respect to this one matter on which I

will talk this morning: he cannot attend a patient and at the same time evade the legal responsibilities incident to such attendance. You may, however, search most of the statute books for statement of the legal relations of physician and patient, and you will find little or nothing concerning them, because they are regulated merely by the common law, as interpreted by a long line of court decisions.

The physician is under no obligation to treat any patient or to treat any class of patients. He may refuse to respond to any call that comes to his office, and for such refusal he is answerable only to his own conscience and to public opinion. When a human life is at stake in an emergency case, for instance, it is a physician's moral and ethical duty to humanity to care for the patient, even though the case be outside the line of his special field of work. But should he refuse to do so, even though the patient be injured by his refusal, he incurs no legal liability; the censure of the public and the pangs of his own conscience are the only penalties. Remember, then, that if you assume professional obligations to a patient you do so voluntarily. If you do not wish to assume them, you should not take the case. The obligations which the patient assumes to the physician are also generally voluntary on his part. There are, however, instances in which this is not the case. An infant or a lunatic does not voluntarily assume any obligations to the physician. Nor does a prisoner: when he is sick, the prison physician serves him whether the patient wants it or not; neither do men in the army and navy, who are served by the physicians in the service; nor does the man or woman who becomes unconscious on the street or in some public place, necessitating immediate medical aid. Aside from these few instances, the relation of the physician and the patient is always brought about by the voluntary act of the two parties.

The relation between physician and patient is commonly based upon what the law calls a contract, and a contract always signifies the meeting of the minds of the parties to a voluntary agreement and the assumption of mutual obligations by such parties. A physician may, however, have no contractual

relations to his patient and yet be liable for any shortcoming on his part, whereby the patient is injured. Such, for instance, is the case of the physician treating a dispensary case, or the case of a physician who acts as an examiner for some public-service corporation. In these latter cases there is no contract between the physician and the patient or the person under examination, but if the physician injures him, the patient has a right to sue and to recover damages.

The contract between a physician and his patient may be any one of several well-established kinds. It may be written or it may be oral. It may be expressed in words or it may be implied from circumstances. The express contract is not necessarily a written contract; you can make an express contract by word of mouth just as well as you can make it in writing, the only difference being with respect to matter of proof. There are a few exceptions to this rule, which it is not necessary to discuss at length here, as ordinarily they do not occur in the practice of a physician. Generally speaking, if the parties agree by word of mouth or in writing each to do certain stated things, an express contract enforceable in law has been created. An implied contract, however, is one in which there is no such agreement expressed in words. In these cases the law steps in and says that the act and conduct of the patient and the physician imply an agreement on the part of each to do certain things even though, as a matter of fact, neither party ever gave the slightest thought to the terms of such an agreement.

A physician receives a call at his office and answers it. He finds a case of typhoid fever and continues to treat the patient. He may by law collect his bill, even though the patient never said a word about paying, and the patient may sue for malpractice, even though the physician never promised in as many words to treat him according to any standard. A contract may be in part expressed and in part implied. Contracts of this kind are frequently created with respect to operative work, the surgeon and the patient agreeing upon the amount that is to be paid for the surgeon's service, and leaving all other terms of the contract to the ordinary implications of law.

It may interest you to know that the expressed contract is commonly the contract of the quacks, although it is not necessarily so. The quack advertises that he will give a written contract that no money will be demanded if a cure is not made, and to many a poor man, or even to a rich man, who has spent much money with the reputable profession without obtaining relief the proposition is alluring. To go into the office of a physician and to receive treatment without any monetary obligation on your part unless you are cured seems attractive; most physicians do not guarantee so much. A careful examination of the guarantee which the quack will give, however, will frequently disclose a clause that protects the quack against any likelihood of suit.

I recall the case of a reputable, upright business man, who had increasing trouble in passing his urine. He had consulted some of the best physicians in the country, and they agreed that he was suffering from an enlarged prostate and that there was nothing to do for him except to operate. Dreading an operation, the man strayed into the office of a quack, who promised to cure him without an operation. The quack asked the patient, however, to give him as a guarantee of good faith promissory notes to the amount of the prospective bill in case of cure, the quack promising not to collect them until after the cure was effected. As you may well imagine, the patient was not cured, and when he demanded the return of his notes, he found that they had been negotiated and had passed into the hands of an innocent third party, for value, and without notice of the conditions under which they had been given to the quack. The patient then sought to recover from the quack the amount of the notes and took his guarantee to his attorney. But his attorney promptly discovered that the guarantee was adroitly worded so as to involve an admission on the part of the patient that the cause of his trouble was self-abuse. Rather than submit to the presentation of such a contract in court, the patient abandoned all efforts to recover the money out of which he had been swindled. Sometimes the contract which the quack enters into is in the form described above, in which the patient is technically made to admit that his troubles arose from self-abuse. In other cases

the admissions on the part of the patients are of gonorrhea and of syphilis. Manifestly, the patient does not ordinarily care to go into court to enforce a contract in which he has technically made such an admission, even though he may be able to prove that the admission was fraudulently obtained and was not based on fact.

A physician can, if he so desires, lawfully contract with his patient that unless the patient is cured the physician will make no charge for his services, and if the physician does so he can collect no fee from his patient unless a cure is effected. There are, however, limits upon the contracts which a physician may lawfully make. He cannot lawfully contract to do an unlawful act. For instance, he cannot lawfully contract to murder, or to influence unduly a person in making a will, or to do a criminal abortion. If a physician should make such a contract and fail to carry it out, he could not be held responsible in court for the breach of the agreement. Moreover, a physician cannot take a case and relieve himself even by express agreement from the consequences of neglect or lack of ordinary knowledge and skill on his part. Such a contract is contrary to public policy; for certainly a physician should not undertake to care for a human life unless he is sufficiently careful and competent to do so. If he takes a human life into his hands, he must assume the burden; if he is unwilling to assume the burden, then he must not take the case.

The time when an express contract between a physician and his patient springs into existence is always sufficiently clear. The time when an implied contract is born is equally clear, although not so manifest on the face of the circumstances that give rise to it. A call comes to a physician or is sent to his office, and he or some responsible person employed by him promises that the physician will respond. Instantly a contract has been established between the physician and his patient, and if the patient relies on the physician's promise to respond to the call and is injured thereby, the physician is liable for any damage that may result. Or even without any promise by the physician or on his behalf he may respond to a call, and the very

circumstance of him so responding gives rise to an implied contract between him and the patient from whom the call comes.

The duration of the physician's engagement to attend a particular case is a matter of considerable interest. It is not necessary that the physician should be summoned by a patient for each and every call; having accepted the call or having once visited the patient, the physician is under an implied contract bound to continue to attend the case. If it is not his intention to do so, he must give the patient definite notice that he desires to give up the case, and even then it is his duty to continue in attendance until another physician can be obtained or until his attendance is terminated by some act on the part of the patient.

There are several ways in which the physician's connection with a case may be terminated. The death of the patient terminates the contract, except in so far as relates to the subsequent liability on the part of the patient's estate or of those responsible for his care to pay the physician for his services. It is important for the physician to remember that death terminates his contract with the patient in so far as his professional services are concerned, for this shows him clearly that he has no control over the dead body and why a physician cannot lawfully do an autopsy without the express consent of the proper legal custodian of the corpse. The recovery of the patient will terminate the physician's obligations to attend the case quite as effectually as will the patient's death.

Cases occur, however, in which the patient does not die and does not recover—cases in which recovery is impossible, and in which the physician's services are in a certain sense of no medical value. Under such circumstances the contract on the part of the patient to pay for the physician's services must be regarded as at an end, unless the contract is extended by express agreement. Certainly it would not be right for a physician to continue in attendance on a case in which he knew he could render no benefit to the patient and to undertake to collect for visits made under such circumstances, unless the patient or some one responsible for the payment of his physician's bills clearly understands

the circumstances. The physician may find that the patient or his family obtains comfort from his visits and desires him to continue in attendance even though his professional skill can avail nothing. Under such circumstances there is no legal or moral reason why his visits should not be continued, and if they are, the physician has a right to collect his fees; for a visit of this kind consumes the physician's time, which is his capital, quite as much as does a visit in which his professional skill and knowledge may be called into play with a likelihood of effecting a cure.

There is a third way in which the physician's relations to his patient may be terminated, and that is by the express wish of the patient. When this has been done the physician is, of course, under no further obligations to the patient. The patient does not have to give the physician any statement of any reason for dismissing him. On the other hand, however, if the physician desires to give up the case; if he feels, for instance, that he has lost the confidence of the patient and his family and that the strained relations are doing no one any good, he cannot give it up in any such summary way. There must always be due notice of a desire on his part to be relieved. By due notice is meant notice sufficient to allow the patient to obtain the services of some other physician. It has been questioned, indeed, whether a physician has a right to give up a case under any circumstances when the patient desires him to continue in attendance. The argument in favor of such a view is that a physician who is personally acquainted with the condition of the patient during the earlier days of the illness and who knows what lines of treatment have been followed and with what effect is in a much better position to care for the patient during the latter days of the case than any other physician possibly can be, and that under any and all circumstances the patient is harmed by the withdrawal of the physician who has cared for him first. It may well be supposed that the patient would have grave difficulty in proving that any actual harm had occurred by the physician's retirement, and in the absence of proof of injury he would be unable to get a verdict.

A contract between a physician and his patient always implies certain mutual obligations. It is necessary, however, to consider the obligations of the patient and those of the physician separately. To what extent, then, is a patient required by the ordinary contract between a physician and patient to cooperate with the attending physician? The patient, in the first place, is obliged to give the physician a fair history of the case; he must submit to any reasonable examination; he must follow all reasonable instructions received from his physician; and he must pay a proper fee. The obligations on the part of the physician are to care for the patient with due diligence, to bring to the service of the patient ordinary knowledge and skill, to use the best possible judgment, and to respect the confidence of the patient.

Time will not permit us to discuss at any length the obligations of the patient. Briefly, it is not necessary that the patient volunteer his history; the physician must suggest salient points and ask for information. The physician cannot expect his patient to volunteer or suggest that an examination of any kind be made; sometimes the patient does so, but more commonly he does not. If the physician's request for an examination is a reasonable one, and the patient does not give his consent, the patient alone is responsible for the consequences. The same is true with respect to the instructions that the patient should follow. Failure on the part of the physician to give instructions necessary for the proper treatment of the case renders the physician liable for any ill consequence that may ensue as a result thereof, but if the physician gives such instructions and the patient fails to follow them, the patient himself must bear the consequences. In the absence of an express agreement as to the amount the patient is to pay the obligation on the part of the patient is to pay as much as the services are worth, and this is determinable by the court in event of dispute. Under an express contract the physician can collect the amount that his patient may have agreed to pay, regardless of the actual value of the services, unless the patient is an infant, insane, or, in some

jurisdictions, a married woman, or unless the agreement has been extorted by means of fraud or duress.

The obligations of the physician are, as I have already stated, reciprocal to those of the patient. In the first place, the physician must exercise due diligence. There are two ways of defining due diligence on the part of the physician: One is to say that it is diligence in proportion to the gravity of the case. The diligence given to a case of gonorrheal ophthalmia is not the diligence required for an ordinary catarrhal conjunctivitis. The diligence that is required in the amputation of a finger at the terminal phalanx would not suffice in a case of an amputation of a lower extremity at the hip-joint. Due diligence is defined also as the diligence which the average physician employs in similar cases. As diligence is with the average physician proportionate to the gravity of the case in hand, both definitions amount to the same thing.

The second of the obligations of the physicians is to serve his patient with ordinary knowledge and skill, and this is measured by the knowledge and skill of physicians at the same time in the same locality or in similar localities. The standard is not a very high standard. The physician does not need to be as learned as the best physician in his community, but he cannot be as incompetent as the poorest. So long as he keeps at or above the average, he does all that the law requires of him, and even though he may not cure his patient, or, in fact, though he may do actual injury, he cannot be called upon to respond in damages, at least not be called upon to do so on the basis of deficiency of knowledge or skill. In determining the legal requirements of knowledge and skill a physician is judged by the standards of the time and of the place in which he practises. A physician in Chicago could not call in a witness from a small rural town and prove that the Chicago practitioner was blameless because he had used the knowledge and skill of the average practitioner of the small town. Neither could he justify his practice by showing that it had been in general use years before or by showing that it might be in use some time in the future. A physician will be judged, too, according to the practice of the particular system

of medicine with which he identifies himself; a physician of the homeopathic school will be judged by the standards of homeopathy, and a physician practising regular medicine will be judged accordingly. A physician who specializes in a certain line will be judged according to what he holds himself out to the public to be: not by the average of physicians generally, but by the average of specialists in his particular line.

Another criterion of the physician's work has reference to the exercise of judgment. He must use his very best judgment; not ordinary judgment, nor average judgment, but the very best judgment of which he is capable. And finally, but not least, among the physician's obligations comes his obligation to secrecy, or "confidentiality," as it has been termed, with respect to information obtained from patients professionally. It is greatly to the credit of the medical profession that it is so strict in the following of this rule of secrecy. So little is said in medical schools and in medical societies about it that it is a wonder that the rule is not violated often. The old Hippocratic oath, although not now formally administered, is yet commonly lived up to by the profession in so far as relates to its obligations to secrecy, and cases in which physicians have violated the confidences of patients are extremely rare. In every case it is the physician's duty to respect the confidences of his patient, even when testifying in court. The same rule holds true, of course, in reporting cases to medical societies or in publishing accounts of them in journals and in books. Under such circumstances, the identity of the patient does not interest the members of the society or the readers of the journal or books. They are interested in the case from a scientific standpoint only, and if the identity of the patient is not disclosed, the case can be published. Of course, if the patient consents to the disclosure of his identity, as he does when he voluntarily appears before a medical society or in a clinic, there can be no legal objection to the disclosure.

There are one or two matters in respect to the relations to physicians and patients which must be considered, which yet do not come under any of the foregoing heads. The first has reference to the physician's rights to examine his patient. An exami-

nation always requires consent on the part of the patient or on the part of some one who is authorized to give consent for him, but consent may either be expressed or implied. If a patient is asked to remove his clothing in order that an examination may be made or told to go into the next room so that the nurse may prepare her for examination, and if the patient does either of the things, the very act implies consent to the examination. The same is true of operations. Consent may be implied in the same way or it may be expressed. In connection with operations, however, it is necessary to consider very carefully the extent of the surgeon's rights to operate in any given case. The question arises not only as to whether consent has been given, but also as to what the consent was given for. The surgeon can lawfully do only so much as has been agreed upon, and it is always desirable to have full authority to use your discretion as a surgeon, obtaining it before the patient goes under the anesthetic, for it will be too late to think about the matter afterward.

An interesting case occurred a few years ago. A trained nurse had a diseased ovary, and knew that possibly both ovaries were diseased. According to her statement, she went to the operating-table with the understanding that if only one ovary was diseased it was to be removed, but that if both ovaries were diseased neither was to be removed; for she was engaged to be married and did not wish to be unsexed. The nurse was operated upon and both ovaries removed. Upon her recovery she sued the surgeon for damages. The surgeon claimed, however, that when the patient had given him the instructions which she claimed to have given, he replied that she would have to leave to his judgment what was to be done after the abdomen was opened and that to that reply she had acquiesced. Although the patient appeared to have no recollection of such acquiescence, the case was decided in favor of the surgeon. Unless the surgeon has the patient's authority to do whatever may be necessary, the surgeon must have the consent of some one authorized to answer on behalf of the patient before he can go beyond the operation agreed upon.

In a recent case a man was to be operated upon for a hernia

on one side. When the patient was brought to the operating table under anesthesia, the surgeon found a hernia on the other side, in his judgment more dangerous than that upon which the operation was originally intended to be performed. The surgeon, exercising his own judgment in the matter, operated upon the more serious hernia, and the patient thereafter sued him for damages. In this case, however, the court took a common-sense view of the matter and rendered a verdict in favor of the surgeon. I think that it may safely be said that here the similarity of the operation proposed and the operation actually done influenced the verdict, and it would not be safe for any surgeon relying upon this case to do an operation radically different from that which was originally planned.

Another situation which the physician must be prepared to meet and to take the responsibility of if necessary is that of restraining his patient. Wherever restraint becomes necessary by reason of delirium or insanity or for any other reason, it is always better to place the burden of the actual restraint upon the family or upon those immediately responsible for the patient's care. Not that the physician has not the authority to exercise such restraint, for he can lawfully restrain a patient if such action is necessary to save a patient's life or that of others or to save him or them from serious bodily harm. If he does so, however, he may at least be made the defendant in a damage suit and be put to the trouble and expense of justifying his action. For this reason it is better that the burden be placed upon those who are called upon by natural ties to assume it and who are much less likely to be subjected to suit by a dissatisfied patient upon his recovery from the condition which made the restraint necessary.

All these obligations on the part of the physician and on the part of the patient would be of no use were not legal methods provided for enforcing them, or at least for procuring satisfaction for the injured party in event of their breach. It is impossible, this morning, to go at length into these methods. To do so would require a discussion of the legal responsibility of the patient and of various other persons, and possibly of corpora-

tions, for the payment of the physician's fees. It would be necessary, too, to discuss methods of enforcing payment in cases where payment could not otherwise be obtained. Malpractice, both civil and criminal, would also have to be discussed at length, and this would lead to a consideration of the matter of contributory negligence. Any of these subjects would afford ample matter for consideration for the full clinic period for the day, and we must, therefore, pass them by at the present time. I cannot close, however, without calling your attention to the fact that what I have discussed this morning have been merely the minimum limits to which the physician may descend and the minimum limits to which the patient may go without incurring legal liability. The physician who does not do at least as much as has been pointed out as his duty will be unable to collect his fees in a court of law. He may be made to answer in damages in a suit for malpractice. Conceivably he may even be fined and imprisoned in a prosecution growing out of criminal malpractice. The patient who does not do his part and who suffers injury may not only fail to get well, but he may, by reason of such contributory negligence, be unable to collect from the physician who attended him even for such damage as the physician's ignorance or neglect actually caused. I hope, however, that no one here is interested in determining how little he can do without subjecting himself to legal liability. I hope that no one here will be satisfied to win from his patient merely such a money payment for his services as the law authorizes. For if you would succeed in the practice of medicine it is necessary not that you do as little as the law requires of you, but that you do as much as your mental and physical strength will permit; that you be not merely as good as the average, but that you be as good as the best. And if when your patient has recovered, or even when your patient has died, the patient or his family feel that they have satisfied your just claims by a money payment; if they feel that they do not owe you any debt of gratitude and affection, you may know that you have not yet ascended to the higher planes of medical practice.

Dr. Murphy: I echo the sentiments of the gentlemen present

in extending to Dr. Woodward our appreciation of his statement on the relations of the physician to his patient. We appreciate very much having him with us and giving us this instructive talk. I wish to thank you, doctor, for your kindness.

VISITING DOCTOR: Has the patient's physician the right to testify against the patient in a suit against a corporation?

DR. WOODWARD: If a physician is employed by a patient for the purpose of treating him for any injury or disease, he has no right to disclose any information to any corporation or to any party who is liable to be sued by the patient because of such injury or disease, unless the patient consents to such a disclosure. Whether he may be required to make such a disclosure in a court of law will depend upon the law of the particular jurisdiction in which the cases arises, and the laws of various jurisdictions regarding what are known as privileged communications vary so that it is impossible to say what will be required in any particular place without consulting the statutes and the decisions in that particular jurisdiction. If, however, a physician is not employed by the patient for the purpose of treating him, but is employed by a corporation which is liable to be sued or by a person who is liable to be sued, for the sole purpose of examining the patient and making a report, the physician clearly may make the examination and may report to the corporation or person who employed him what the result of the examination was.

TUBERCULOSIS OF KNEE: ARTHRODESIS

Treatment of Tuberculous Joints

HISTORY

PATIENT, a female aged forty-five years, comes to hospital on account of inability to use left knee-joint. Present trouble began in May, twenty-two years ago (1890), when she had pain in this joint when she walked a long distance or gave a sudden jerk to the joint. The pain was continuous, but not severe at first. It gradually became worse, and after one year and nine months she had to go to a hospital for three weeks. Before entering the hospital she had to use a cane. The week before this trouble began the patient had to remain home from school for a week with an ulcerated mouth and sore throat. Her knee was a little swollen when she entered the hospital. There it was painted with iodin, blistered with cantharides, and put up in a plaster cast for six weeks. After this cast was removed she wore a posterior metallic splint extending from calf to thigh for six months, and used a cane when going about. After this she wore an elastic knee-cap and got about without any support. When she came to this country twelve years ago the left leg was a little stiffer than the other, and she favored it a little when walking. She was able to get about without trouble until July, 1909, when she felt that her health was failing. She went to the country, but had to commence using a cane. Since then her knee has been getting gradually more painful and tender. She cannot flex her knee on account of the tenderness. No shooting pains at night. Is in good health otherwise. As a child had scarlet fever. No typhoid. Menses regular—twenty-eight-day type. No cough. Never had any cervical adenitis. Never injured joint to her knowledge. Tuberculin test gave patient nausea,

malaise, headache, temperature 102.4° F., and increased pain in her knee.

COMMENTS AND OPERATION

DR. MURPHY: That began how many years ago?

THE INTERN: About twenty years ago.

DR. MURPHY: Was the knee swollen?

THE INTERN: Yes, doctor.

DR. MURPHY: "Slightly" swollen. That tells the story, because we must make a diagnosis on the original condition of twenty years ago. The clinical history is of the greatest possible significance in making a differential diagnosis of the lesion at the onset. Did you say the knee was "stiff"?

THE INTERN: No, doctor.

DR. MURPHY: No. That is important. If it were stiff or ankylosed, she would not need an operation. The fact that it is not ankylosed and is very painful is why she needs an operation. If she had a bony ankylosis, she would not need me. I will produce an ankylosis by removing the pathologic lesion that is there now and that has incapacitated her so long. There is considerable limitation of motion in the joint, and it is extremely painful and tender. An ankylosis after the lesion this woman had is one of the best results that can be secured.

What's the matter with her? What's the matter with her, judging by that history? She had a sore throat a week before she began to have pain in her joint, but when she got the pain in her joint it did not come on with a chill, it did not come on with a high temperature, it did not come on with an immediate incapacity, but it got a little more painful and a little more painful, until finally, at the end of six weeks, she was incapacitated. That is never the history of a metastatic arthritis of pyogenic origin. It is never the history of an epiphyseal or a metaphyseal osteitis of pyogenic origin. In both metastatic arthritis and metastatic osteitis of the ends of a bone the patient is incapacitated inside of forty-eight hours from the acute onset. The patient has a chill and an elevation of temperature. If the metastasis is in the synovial membrane, the joint is swollen. If

Fig. 18.—Right and left knee of case of tuberculous arthritis in which an arthrodesis was done. The internal condyle of the left femur (knee on right of picture) and the internal tuberosity were the seat of the disease. The right knee was normal.

Fig. 19.—Lateral view, from inner side of leg, of the tuberculous knee-joint shown in the previous picture.

it is in the ends of the bone, above or below, the patient has intense pain, high temperature, the joint is not swollen, but it is incapacitated. What lesion is it that comes on in that slow, insidious way and that takes from three to seven weeks to incapacitate the patient, and causes limitation of motion? Tuberculosis. This is the typical history of a tuberculosis which repaired itself temporarily; whether it began in the bone or in the synovial membrane we do not know. We believe it began in the bone. Why? Because the doctor said the joint was "slightly" swollen. When it begins in the synovial membrane, which is rare in adults and common in children, the joint swells quite rapidly and to a considerable size and remains of that size for a long time. When a tuberculous focus appears first in the epiphysis and not in the synovial membrane, which is the common place in the knee, but always in a uniform place in the knee in adults—when it begins in the epiphysis, there is an effusion into the joint on account of the close proximity of the tuberculous infection to the synovial membrane, just the same as there may be a pleural effusion when there is an inflammatory condition in the lungs or a tuberculosis near the pleura, just the same as in cases of tuberculous epididymitis, there is an effusion into the tunica vaginalis, but in none of the three instances mentioned is there a tuberculosis of the skin or serous lined surfaces. It is the close proximity of the disease to these surfaces that causes the early effusion. That may entirely subside without there being any infection in the joint at all.

Just because of the fact that this patient had a sore throat or pharyngitis, which is a common cause of metastatic inflammation in the joint, we made a tuberculin test. We used five drops of dilution No. 2 of Lucius and Brunning's old tuberculin. That is our test dose in the average case, except in cases of acute enlarged lymph-nodes. If you use dilution No. 2 in these cases of acute enlarged glands, the reaction is too severe; the temperature rises to 105° to 105.5° F., and the patient has nausea and vomiting, and will be intensely sick. In the average case 5 minims of No. 2 is a justifiable dose. What is the reaction? That dose was given at 5 P. M. in this case. Why do we mention the

hour? Because the temperature elevation of a tuberculin reaction appears, as a rule, between twenty and twenty-eight hours after the injection. If the patient's temperature rises to 103° to 104° F. within two or three hours after the injection, that is not a tuberculin reaction. That is caused by something else.

THE INTERN: The temperature was 102.4° F. twenty-two hours after the injection.

DR. MURPHY: That is the typical time, but a rather severe elevation of temperature. It usually rises to 101.3° or 101.4° F., but in this case it was 102.4° F. We had another case which gave a reaction of 102.8° on the same day. After one has used this test for a long time he becomes very familiar with it. Occasionally the temperature rises to 102.3° F. in two hours. We do not consider that a reaction at all. It is of no value.

Now, you see, she has no ankylosis. She has a limitation of motion, but no ankylosis. What do we wish to do here? Here is a woman who has been greatly reduced in her effectiveness and has suffered enormously for twenty years. What do we want to do? We cannot do an arthroplasty; we cannot get a new joint. What we can do and what we hope to do is to get a bony ankylosis. It is the best thing we can get for this woman, to give her a stiff knee.

A rubber tube constrictor has been placed high up around the thigh. The entire field of operation has been painted with 3.5 per cent. tincture of iodin. We are ready to begin the operation. A straight incision is made directly across the joint, just below the patella.

We are going to remove the patella. The edges of the incision are now held back with retractors to give us a good exposure of the joint. The capsule of the joint is now in view. These are the most difficult cases because of the pyogenic or saprophytic infection present with the tuberculosis. There is the ligamentum patellæ which I am dividing, and now the tuberculous exudate is welling out. You see she had an active reaction to the tuberculin test because she has an active tuberculous process here, with a mixed infection. Now we wish to remove all this tuberculous tissue. We will take out the patella

and remove all the upper portion of this joint capsule with it. That exposes the joint. It is filled with pus and débris. The cartilages have been destroyed. The internal femoral condyle is eroded and devoid of cartilaginous covering. We do not wish to take off much of the articular ends of the femur and tibia, because this leg is to be straight, and if we take off much bone, the union will not be firm enough.

I am getting my bearings here as to how much bone needs to be removed. Here are the crucial ligaments. I wish to retain the posterior crucial ligament and displace it backward if I can, so as to aid in fixing the capsule. We do that regularly in our arthroplasties. I will make the angle of excision a little from before backward, as that gives the best subsequent result.

I am sawing off the articular surface of the femur where the patella was attached, so as to be sure and get out all the tuberculous débris. There is apparently no tuberculous lesion in the bones. It is normal bone as far as appearances go. If that is really true, then this tuberculosis was originally a synovial or a subsynovial tuberculosis. I am not so sure about that, however. The history did not indicate that. No, it was an osteal tuberculosis. There is a focus down deep in the inner tuberosity of the tibia, not connected with the surface. We will curet that out.

Let the records show that the disease began as an osseous tuberculosis in the internal tuberosity of the tibia, and that it extends down below the epiphyseal line. That is very rare. It is very rare to have a tuberculosis transgress the epiphyseal line. We have sawed off the articular ends of both femur and tibia, so as to get broad surfaces for approximation. We disinfect the field of operation thoroughly with a 5 per cent. phenol solution. We think it is the most effective means we have for protection against further infection in these cases. We are now ready to complete the operation by inserting an interosseous splint to aid in maintaining approximation and to favor bony union. We use magnesium for the interosseous splint. [A picture and description of this splint are shown in the June, 1912, number of the CLINICS.] Magnesium has the advantage of being

dissolvable, and in tuberculous cases that is a disadvantage, because the absorption produces a gas which must be removed by aspiration from beneath the skin. The result of repeated aspirations is that a sinus occasionally forms between the two portions, which retards the definitive healing. It is a well-recognized truth in the management of tubercular lesions that, first, little or no catgut should be used as ligature material; second, phosphor-bronze and fine silver wire are the best ligature materials in these cases; third, after carbolic acid or other disinfectant solutions have been used to destroy the pathogenic microörganisms the cavity should be thoroughly washed out with salt solution and dressed dry. A little iodoform should be sprinkled over the surface to stimulate the connective-tissue formation and thus encapsulate or grow over any offending tubercle bacilli or tubercular disease that might remain. Magnesium has no special disadvantage in osteotomies, and acts as an immobilizer. It is the ordinary magnesium metal ribbon, about one inch wide and $\frac{1}{8}$ inch thick. We put it in in two different directions at right angles to each other, and in that way we get the desired immobility. Immobilization is a very important thing in all these cases. (In the more recent cases I have been using a silver or phosphor-bronze plate. The former is the better because it has antiseptic properties.) Two slots, an inch and a half in depth and at right angles to each other, are made in the ends of both bones. Into these slots the magnesium is placed—first into the tibia, and as the leg is slowly straightened with traction they are slid into the slots made for them in the femur. Now you see we have it complete. That prevents all motion, and this magnesium plate is absorbable and finally disappears, so that you never need to take it out. It lasts about eight to ten weeks. If there is much accumulation of hydrogen gas in the tissues, we aspirate and withdraw it just as we would fluid. As a rule, however, except in tuberculous cases, the gas is absorbed by the tissues.

Now we will suture the capsule with chromicized catgut. Our hope in that is to get what? It is to get an immobilization of the knee. The lateral capsule is the real support of the joint. Formerly we used the phosphor-bronze wire as a suture material

here. It is a splendid material, except that it occasionally causes a sticking sensation, like a needle-prick, when it is exposed close to the skin, and it has been annoying in that way. We like it better than any kind of suture for this purpose. The fibrous capsule will be fixed firmly, so that it will not separate, but support the knee. The knee cannot rotate; it cannot move laterally on account of the method of inserting these magnesium plates. We rarely ever need to put on a ligature to stop bleeding. We have protected that wound from the skin by means of sterile towels all the time, so that our hands keep entirely free from contact with the skin.

We will now put in a few plain catgut sutures to unite the soft parts. The skin is united with horsehair. At the end of ten days we will commence to irradiate this knee with the Röntgen ray and stimulate the production of the encapsulation. A full-length plaster-of-Paris cast will be put on after we have dressed the wound with bismuth subiodid, collodion gauze, and 5 per cent. phenol gauze.

Visiting Doctor: Do you keep up the tuberculin treatment, doctor?

Dr. Murphy: All the time, after the wound gets over its acute reaction to the operation. That is, we commence to give tuberculin in fifteen days. Then we will continue that tuberculin treatment for probably a year. For therapeutic purposes we start with 5 drops of dilution No. 3, injecting it into the arm and repeating the injection every five to seven days, unless the reaction is too severe. We aim to get a temperature reaction of not over 99.6° F. The dose is increased two drops at a time until 20 drops is reached. Then we give two drops of No. 2, in the same manner as before, but increasing the dose only one drop at a time. When the dose again reaches 20 drops, we give one drop of dilution No. 1, increasing the dose one drop at a time. We have never given more than five drops at a time of dilution No. 1, because the patient has been thoroughly immunized when the treatment had progressed to that stage.

One of the greatest dangers in giving tuberculin is in giving too large a dose. A reaction temperature above 100° F., as a

rule, indicates that the dose was too large, and that the opsonic index will be diminished rather than increased. I am surprised by the number of patients who come to me saying that they are taking tuberculin and that their reaction temperature is 101°, 102°, and even 103° F. These patients are being injured. There is no "average" dose. The individual reaction is the only criterion by which one gets accurately the proper administration of tuberculin as a therapeutic agent. Tuberculin is most powerful and efficient if given properly; it is highly destructive if improperly given. We always use in this clinic the Lucius and Brunning's preparation of old tuberculin.

Now let us go back and see how the pathologic findings correspond with the clinical history. She originally had a tuberculosis in the internal tuberosity of the tibia. How old is she now?

THE INTERN: Forty-five years.

DR. MURPHY: Twenty years ago she was twenty-five years old. The disease began at twenty-five. It would be exceptional to have it begin in the synovial membrane at twenty-five. It began in the bone, and slowly worked up into the joint. She was incapacitated temporarily in the beginning, with a little swelling of the knee, which later subsided. The tuberculosis encapsulated itself or healed by the formation of fibrous cicatricial tissue on the surface of the joint. She went on in fairly good condition until she had this manifestation of the further progress of the disease two years ago.

In analyzing the cases of bone and joint tuberculosis as they occur in this country we would say that we practically never see cases of tuberculosis that begin in the metaphysis, that is, that begin in the joint end of the shaft, either in children or in adults. I say practically never, but there are exceptions to that rule where the disease begins in the metaphysis. This occurs usually before ossification has taken place in the epiphysis. Then the disease begins in the joint end of the shaft. Mr. Stiles, of Edinburgh, in his articles on tuberculosis of the bone, said that in Scotland they very commonly have cases of tuberculosis of the shaft of the bone, and that they have them up to six, eight,

and ten years of age. The interpretation which Mr. Stiles makes of that is that in Scotland it is more likely the bovine type of tuberculosis, because they drink so much milk and eat oatmeal—in fact, that is almost the exclusive diet at that age. The infection occurs in the metaphysis and not beyond the epiphyseal line toward the joint. The reason it does not occur in the epiphyseal line in children is that the epiphyseal line is a cartilaginous structure, and it is difficult or impossible to infect a cartilaginous structure with tuberculosis. Tuberculosis never primarily attacks the cartilage; neither does it ever primarily attack the fibrous portion of the capsule. Tuberculosis, therefore, in or near a joint occurs in one of three positions: in young children, very commonly in the synovial membrane; in older children, about ten years of age, in the epiphysis; and in adults it is almost always in the epiphyseal portion of the bone.

In the early stage of the disease in the metaphysis, the best operation is excision of the metaphysis, with the implantation of a portion of the tibia of the other leg after all evidence of the disease has subsided. There you have all the conditions favorable for the regeneration of bone. For instance, in the case of a child six years of age who has tuberculosis in the upper end of the tibial shaft cut into the periosteum, elevate it carefully from the bone, and cut the bone off above and below the disease, but always keep on the shaft side of the epiphyseal line. Just enucleate that bone out of the periosteum, and if there is no infection, immediately transplant a piece of bone from the opposite tibia, and the bone will be fully reproduced, but unless you put in some mechanical means of preserving the elongation and conformation of the bone during the process of regeneration, it will become twisted and deformed and be a poor limb, while if you put in a piece of tibia, it will keep that limb at its full length and bone regeneration will take place. We use the tibia because then we are guaranteed rapid reproduction, and the conformation of the limb is preserved from the beginning. It greatly stimulates the reproduction of bone in these cases. If there is infection present, do not transplant until the infection has ceased to give any evidence of activity.

The class of cases over which there is great controversy at the present time is synovial tuberculosis in the young. What will you do with a case of synovial tuberculosis—an epiphyseal tuberculosis of the hip-joint? How will that case be managed? These are the most difficult cases to handle, and it is only by an analysis of the changes of sentiment in the management and methods of treatment during the past twenty or thirty years that you can fairly balance the situation and the results obtained. You may remember that at the last meeting of the American Medical Association, and at the meeting preceding that, a surgeon advocated the immediate removal of the epiphyseal line, articular end and head of the bone, and the production of an immediate ankylosis in these cases. Let us analyze that treatment for a moment. I have been through the mill and I paid the price for learning. Thirty-four years ago exactly Dr. Christian Fenger, then a newcomer in Chicago, performed the first systematic excision of the joint as we did it this morning. I was then his intern in the Cook County Hospital, and became one of the early advocates of the removal of the tuberculous focus from the bone at an early date. What happens when you take off the head of the femur, including the epiphysis? The femur stops growing in length, and you get an ankylosis, but as the child grows up the disparity in the length of that limb and the other becomes greater and greater, and you have the patient in a worse condition than the tuberculosis could possibly have left him if you had done nothing. If you let it alone, the epiphysis will grow more, the head of the bone will finally absorb, there will be a shortening and sliding up of the shaft of the bone on the side of the ileum, there will be a fibrous or possibly a bony fixation—but he will have a limb in many cases as long as his other limb, in some cases much shorter. It is wrong to remove the epiphysis because it interferes with the growth of the bone in length.

We have to look at tuberculosis now from an entirely different standpoint than we did years ago. First, tuberculosis in children is much more readily curable than tuberculosis in adults. Children offer greater resistance to tuberculosis than adults. Tuberculous adenitis in children gets well, as a rule, with good

food and plenty of fresh air. Tuberculous adenitis in adults does not get well in that way. I am speaking now of the lymph-nodes. I like to speak about conditions that we can see and feel. I do not want to speak about matters hidden in the uterus or away down in the esophagus. We want the things we can see when we speak of treatment and cure. In adults the disease is eradicated more readily with the aid of tuberculin and of hygienic conditions if there is no mixed infection. If there is a mixed infection and the gland is open, a cure is effected with tuberculin. We have not made a typical dissection in tuberculous cervical adenitis in this clinic in nearly seven years. It was our regular bread-and-butter work before that time. If we did not have two or three cases of tuberculous glands of the neck a week, we felt we were doing no business. These patients are all treated with tuberculin now, except the suppurating ones, and they all get well. [Dissection and microscopic examination of the gland show that it was tuberculous. The patient is since making rapid strides to recovery, although at first improvement was slow. —Ed.]

I have one case in the hospital now that came in while I was away on my vacation. The patient was treated here, but that case does not appear to be quite right to me. From the position of the gland it is a question in my mind whether this is not a case of Hodgkin's disease, which does not yield to tuberculin, but we are hoping that some day it will be determined that tuberculosis is at the bottom of it. These patients give a tuberculin reaction, but there is no effort at repair as in the case of a typical tuberculous gland.

These lesions in the joints occur in children more commonly in the synovial membrane, or if in the epiphysis, they rapidly rupture into the synovial cavity, so that you have a communication between the synovial cavity and the tuberculous focus in the bone; therefore you have a means of stimulating the process of repair in the joint and getting at the tuberculous pocket, which you do not have in adults. There is a local means of stimulating the repair in tuberculosis. One of the first things to result from tissue stimulation is the production of connective

tissue. Tuberculosis is healed by fibrous encapsulation or surrounding the disease focus with connective tissue or by coffer-damming the lymph-spaces in the tissues. What can we do locally? We can aspirate the joint and inject it with an iodoform and glycerin emulsion, as we used to do years ago. It gave fairly good results because iodoform is a great stimulant of connective-tissue formation. We found in later years that formalin is a better stimulant of polymorpholeukocytosis. We used formalin and iodoform and glycerin for a number of years, and finally we dropped the iodoform, and we now use only formalin and glycerin. We inject a 2 per cent. solution, mixed at least twenty-four hours before it is used, and we always use a screw syringe, because the ordinary push syringe is not sufficiently powerful to force this solution through the needle into the joint. We introduce the needle into the joint very carefully, so as not to abrade the endothelial lining of the synovial membrane, and then make negative pressure. If the needle is in the joint, the synovial fluid will be drawn into the syringe. Then we make the injection. That has no effect at all on this class of cases, because you could not reach that focus in the bone with anything you inject into the knee-joint.

The next aid to repair is tuberculin. Tuberculin has a pronounced healing or repairing effect, not equaled in our experience by any other means of treating tuberculosis. I am speaking of tissue changes.

The next aid to repair is the stimulation one gets from the properly applied Roentgen ray. The Roentgen ray stimulates the production of connective tissue. That is how it cures carcinoma; that is why it acts so favorably in the repair of tuberculosis. Last summer we saw one of its most striking effects. I met a man, the most enthusiastic man on tuberculin next to myself, in Heidelberg—Dr. Wilms. He uses the Roentgen-ray and tuberculin. He has great confidence in the Roentgen ray, repeatedly applied and with a high-tension tube. Our treatments are given more often and with a low-tension tube. I believe that is a mistake on our part. Dr. Wilms showed us his result in joint after joint in which he followed his plan, and

the process of repair is certainly striking. So much for the local treatment, that which stimulates the production of connective tissue, or the encapsulation of the tuberculosis by connective tissue and the immobilization of the joint by the cicatricial contraction that occurs.

What can we do next? In order to favor that process of cicatrization it is essential to get the parts immobilized. For a third of a century or more, since Sayre brought out his plaster-cast treatment, we immobilized tuberculous joints fairly well, but some one began substituting metallic and ambulatory splints, and all that type of apparatus, for the plaster-cast immobilizer. All ambulatory means of preventing intra-articular pressure are a delusion. You cannot prevent the pressure of the head of the femur against the acetabulum by any ambulatory splint that has so far been dreamed of or brought into execution. If you are going to immobilize it and lessen the destructive process, relieve the pressure in the joint. Extension of the Buck's type is the only means to prevent intra-articular pressure and friction during the process of repair. It is our plan to put these patients in bed, put on a Buck's extension with a sufficient weight attached to produce a separation of the articular surfaces, keeping the joint immobilized to prevent rotation, and give tuberculin. Tuberculin is the finest agent as an accessory. You remember the time when dear Dr. Fenger, whom we all loved and respected, would not operate for tuberculous peritonitis except on a sunny day, so that the sun could shine into the peritoneal cavity. We now know that the "sunshine" treatment of peritoneal lesions was entirely "moonshine."

So in the management of tuberculosis here we have a definite clean-cut plan of procedure, and we are getting better results than we ever did before. We are doing no primary excision of joints or bones in children at all. We believe the present endeavor to bring that method of treatment back into vogue again is wrong and will be abandoned. All one has to do is to analyze the results obtained when this treatment was first employed, and then cease to endeavor to revive this obsolete treatment. The tendency in every tissue in repairing tuberculosis is by self-

limitation of the disease by encapsulation of the focus and healing. It needs every kind of stimulus that we have to produce this result. We put these patients first on tuberculin; then we use the Röntgen ray. Then there are the general feeding and fresh air; immobilization and elimination of contact in the joint. Many of these patients get perfectly well and remain well. That gives you an idea of our plan of treatment in this disease.

The skiagram in this case gives us no information at all as to the pathologic condition present. The tuberculin reaction was positive, and there was an active tuberculosis in the internal tuberosity of the tibia with a mixed infection.

Let the record show that there was a pocket of mixed infection between the internal tuberosity of the tibia and the internal condyle of the femur.

The plaster cast is now applied. It extends away up on the thigh. Under the cast we first placed a Gigli saw for the purpose of cutting the cast before the patient is taken out of the operating-room. We leave it open in place of closed. If the limb becomes greatly swollen, you can relax the cast as much as you wish.

PAGET'S DISEASE: AMPUTATION OF BREAST

HISTORY

PATIENT, a female, aged fifty-one years, comes to hospital on account of a cauliflower growth of left nipple and a large mass in the axilla.

Present trouble began August, 1910, as a little dry crust on nipple. This fell off and a little raw surface was left, which quickly crusted over again. This continued for four or five months, when a large crust formed and remained on about eight weeks. When this fell off a small growth on the nipple was found beneath it. This gradually and steadily grew larger, the whole nipple being involved in the growth, until its present size was reached. Seven months ago she found a small mass in her axilla. This was of about the size of a hazel-nut. This has also grown larger. No history of injury to breast; no pains; no previous inflammatory trouble; no pains in any of her bones.

Married at the age of twenty-seven; never was pregnant. Eighteen months ago patient was conscious of something high up in the vagina. After six months she went to a doctor, and he found a small polypus protruding from the cervix. This was cureted away.

Examination.—Nipple of left breast is a large, papillomatous mass, ulcerated on its surface, of the size of a silver dollar. The skin around the base of this mass is not involved, but there is a thickening beneath the skin around the base of the nipple. The remainder of the breast is free from any growth. Beneath the anterior axillary fold there is a large mass about the size of a medium-sized apple, stony hard, triangular in outline. The skin over it is adherent to it, but the mass is not adherent to the chest-wall. The supraclavicular glands are not enlarged. She has an enlarged thyroid.

COMMENTS AND OPERATIONS

DR. MURPHY: What's the matter with her?

THE INTERN: She has a malignant disease of the nipple with a metastasis in the axilla.

DR. MURPHY: What do you mean?

THE INTERN: It started as an eczematous condition of the nipple.

DR. MURPHY: It started first as a crust forming over the nipple, yes. What did the crust come from?

THE INTERN: It was an eczematous condition.

DR. MURPHY: No, it was not.

THE INTERN: It was a small papilloma in the nipple.

DR. MURPHY: It began in one of the lactiferous ducts. It is a case of Paget's disease. Paget's disease uniformly terminates in cancer of the breast,—and a severely malignant type of cancer at that,—and still Paget's disease is treated as an eczema, and the patient is permitted to go on to that awful condition that this patient is in now without being given relief. That is what I want to bring out, because these cases are the easily saved cases if seen early, before the lesion becomes malignant and metastases form. The lesion of the nipple is present often for years before there is any metastasis at all. They are the least malignant of any of the malignant neoplasms in the breast early in the stage of the disease.

When that little crust commences to form and when the patient consults the doctor because of that little crust, in place of giving her a salve for the eczema he should amputate the breast. Explain to her that that little crust is like the little crust on the lip of the smoker, that leads first to cancer and then to death. Tell her plainly that if she permits that to go on the chances are 100 per cent. that the case terminates in cancer, and in the enormous percentage of cases, when it develops into a tumor in the breast or axilla, it terminates fatally. We are responsible for many of these deaths, because these cases come to us early "for the eczema"; that crust is the secretion that comes out of the duct onto the surface, desiccates, and remains,

Fig. 20.—Paget's disease of left nipple, with a metastatic mass in anterior axillary fold.

and finally is a papilloma or a carcinoma. The epithelial edges of the nipple become red and fiery, like a condition known as "proud flesh," and that is the term the patient uses. She says, "Give me something to take the proud flesh off of the nipple," and if you know—and you should know—that that is a malignant neoplasm, you must not give her anything for her "proud flesh," or do anything unless she consents to an amputation of the breast. Be positive! let her go to another doctor,—and she will, after you have told her she is going to die,—but that prediction will haunt her, and she will go to five other doctors, and of the five, three will tell her it is malignant and she should have it taken out, and you will be vindicated. Sometimes the patient will only see one other doctor, and when she sees you the next time she will give you a haughty, frigid stare, because her doctor is curing her with a salve. Never mind! The point that should be emphasized is that she must not be permitted to sacrifice her life through an error in diagnosis. There is such a thing as an eczema in the nursing breast, but it is not this type—not the Paget's type.

There it is now, in the superlative degree. Look at that nipple! Look at that mass under her arm! The prognosis is bad. She will die a cancer death. She may live a little longer by having this operation, but she will die a cancer death just the same. We told her friends that would be the prognosis, whether she was operated on or not, although her life would be prolonged by the operation. This will be an extensive operation. The mass in the axilla is fixed to the skin, but not to the chest-wall. Therefore, we must take out that portion of the skin—in fact, do a radical operation.

We commence the incision just above the lower margin of the anterior axillary fold at about its center, and then pass inward over the chest to the sternum, encircling the breast and meeting the first portion of the incision at the base of the anterior axillary fold, near its inner angle. Then we dissect upward and outward toward the axilla, going downward on the chest-wall as far as the pectoralis major and minor. We cut these muscles at their inner margins close to their attachment to the ribs and reflect

them outward onto the shoulder because we wish to utilize them later.

There is the aponeurosis of the pectoral muscle, which we will remove. I am going into the axilla first and clean that out from above downward before I touch the breast. That will eliminate the possibility of forcing cancer-cells into the general circulation. I thereby block the lymph-chain in the proximal direction. I carefully "wipe" the tissues off the vessels with a strip of gauze. The axillary artery is in plain view. See it pulsate!

I must remove all the glands and the gland-bearing tissue from this axilla, and I do so by "wiping," not cutting or tearing, it with scalpel or scissors.

We have everything in the axilla fully in view. I can show you now why I made a fatal prognosis in this case. There is an enlarged lymph-gland clear up under the clavicle. It lies right on the subclavian vein. I think there are other enlarged glands here. They may be in the mediastinum, where we cannot reach them from this field of attack. We will take out all the gland-bearing tissue. There are more glands here that I want to remove. I will remove all this fatty gland-bearing tissue right up to the clavicle, to make sure that we have removed all the glands in which metastasis may occur. That is very important.

I am back to the surface of the latissimus, *i. e.*, the posterior wall of the axilla. There is the nerve that supplies the latissimus dorsi—the long subscapular. It gives a faradic response. All this enormous amount of work is the story of the horseshoe nail. You remember the man who failed to put in the horseshoe nail and finally lost the horse? That's just what happened here. All that dissection had been made necessary because the warning of the little crust on the nipple was not heeded at the proper time. We will now remove the breast, together with the underlying pectoralis fascia, and also the fascia between the two pectoral muscles in which a lymph-node is occasionally situated.

We have done a most extensive operation here. We have removed all the gland-bearing tissue from the clavicle down to the level of the umbilicus. At the same time we have retained the pectoralis major muscle to fill in the axilla. We took out the

aponeurosis of the pectoralis major and pectoralis minor. The long subscapular nerve is intact. The pectoral muscles are in view. The intercostal muscles are vibrating as she breathes; the axillary vein and artery, the nerves, everything up to the clavicle, are exposed. We are now ready to close up the wound.

The first thing I will do is to turn the pectoralis minor in to cover the first portion of the subclavian artery and to give such protection as was given by the tissue removed, as well as to diminish scar contraction and its effect in producing stasis of the venous circulation. We do not remove these pectoral muscles, first, because we believe it is unnecessary, and second, because we utilize them to fill in the axilla. We do remove all the pectoral fascia, the gland-bearing and lymphatic carrying tissue.

The pectoralis major will be brought up to form the floor of the axilla. It is sutured to the latissimus dorsi behind with a few catgut stitches. That fills in the axilla nicely. We will not have venous stasis, because that axilla is filled, and the contraction of the scar cannot compress the circulation or produce an edema or swelling of the arm or limit its motion. I had a patient here yesterday on whom I operated six or eight weeks ago. It is a pleasure to see the way she swings her arm. That is why we save the pectorals when we can and suture them into the axilla. When we cannot save them, we use the latissimus dorsi for the same purpose, swinging some of its fasciculi forward to fill in the axilla.

All that remains to be done is to close the wound without tension or as little as possible. We use silkworm-gut for that purpose. Horsehair approximates the skin incision. A small drain is placed in the lowermost angle of the wound.

Owing to the necessity of having to remove so much skin here it is impossible to close the wound without causing more tension than we believe is wise. Therefore we will close the wound as best we can with the view of doing a grafting operation later when the open area is covered over with granulations. There remains an area of, roughly, two inches wide and three inches long, which will have to be grafted. In ten days or two weeks the second operation will be done. A large dressing is put on

with the arm by the side and a large gauze and cotton pad in the axilla.

[A Thiersch skin-graft of sufficient size to cover the denuded area was taken from the patient's thigh on the sixteenth day. It was spread out very carefully and sutured to the skin-edges with fine plain catgut. A wire screen cage was fashioned of the shape of a bee-hive, and placed over the field of operation, so that nothing in the way of gauze or cotton would come in contact with the graft. The cage was strapped to the chest with adhesive. The result was splendid. The graft fulfilled its function beautifully. The patient was discharged nine weeks after the first operation, with the wound completely healed, and with good use of the arm.—Ed.]

ACUTE APPENDICITIS

HISTORY

PATIENT, male, aged thirty-six, comes to hospital because of pain in the abdomen.

Present trouble began two days ago at 7 P. M. with a dull pain all through the abdomen. He took an enema and had a good bowel movement, but the pain kept getting worse. He could not find a comfortable position in bed. About 4 A. M. the pain began to localize in the lower right quadrant of the abdomen, where it remained all of that day. Was not nauseated nor did he vomit. About midnight of the second day he had a chill that lasted several minutes. Says he did not feel feverish. Has not taken any food since trouble began. About one month ago he had a similar attack, but no chill. It came on in the morning and lasted all day. That night he felt the pain in the right side, but it had disappeared the following morning, and he went to work. No other attacks. No fever at present time.

COMMENTS AND OPERATION

DR. MURPHY: You say the temperature was normal since coming to the hospital: not at all.

THE INTERN: It was subnormal.

DR. MURPHY: Yes; that's different. His trouble began about 7 P. M. the day before yesterday. All these things must be exact. It is a very important factor in the diagnosis of this case—one of the most important factors. Why is it of enormously greater value in this case to know that than it is in the average case? Let us go over this case. This case is not classic at all. It is very peculiar. He had the original attack and got over it, and was out and at work in two days. Then it looked like an attack of appendicitis, but it was more of the appendiceal reten-

tion type. He had an acute swelling of the appendix, which empties itself, and the patient has never had sufficient absorption of toxic material to give him an elevation of temperature. In all these years I have had only three cases of appendicitis without temperature and two within the last week. So far as we know, I can say this man did not have an elevation of temperature the night of the chill; at least no one took his temperature.

Visiting Surgeon: Doctor, may I ask you to repeat that last remark?

Dr. Murphy: In all these years I have had but three cases of appendicitis that did not have a temperature at some time in the attack. Remember, we often have a temperature within the first hours only in very bad cases; often no temperature at all when the abscess is as large as one's hat. That is usually accounted for by the fact that the temperature is the manifestation of the absorption of the products of infection and not the manifestation of their presence. See what a difference that is! It is a very great difference. We have for so long learned to associate temperature with pus that it is difficult for us to separate the two. Remember, temperature is not caused by the pus: it is the manifestation of the absorption of the pus. When there is no absorption of infective products there is no rise in temperature.

In this case no one took the temperature the night of the chill, but the doctor saw him yesterday morning and said he had no temperature the night before; the temperature was one-half a degree below normal. He had pain, but no vomiting. Whether he had nausea or not I could not learn. He is extremely sensitive over his right iliac zone—so sensitive that when I percussed it, not pressing on it, but simply percussing, he would scream. But his attack began with a chill, which is always a serious matter, because the chills occur so often when the appendix is becoming gangrenous. A chill occurs when the infective microörganisms or their products, or both, are taken up by the circulation in large quantities.

There is another point to which this history does not fit, and when the symptoms do not fit, then we always ask ourselves a

great many questions, and we do a great many things we would otherwise not do. When I came in this morning I asked first for a report on his urine, because not infrequently a stone passing through the ureter gives rise to all the symptoms of appendicitis, without elevation of temperature. I immediately, therefore, asked for a report on the urine. The urine had not yet been examined, so I ordered the anesthesia postponed until we could get a report on the urine. If he has passed a urinary calculus, he will have blood in his urine this morning. He still has a temperature of 97.6° F.—below normal; but here is where we have an important sign appearing, a discrepancy between the leukocytosis and the temperature. The leukocytosis, if he had no infection, would be 7200, 7400, or 7500; after a meal it occasionally is more. He has not eaten anything, however, in forty-eight hours,—or rather sixty hours,—and his leukocytosis since last night has gone from 10,000 to 12,000. We have found that the leukocyte count is of value where the temperature is low, or nearly normal. I would not say normal, because we have not had it normal in any of the cases. When the temperature is 99°, 98.6°, or 100.5°F., we often find the leukocyte count to be 15,000 or 18,000. There it has very great value, while with my original syndrome in the order or "sequence of symptoms," as some one recently named it, that is, pain, nausea, and vomiting, local sensitiveness, and elevation of temperature, we expect and do find a leukocytosis present. We had a patient recently with a leukocyte count of 7000, and he had no elevation of temperature; his attack began at 4 o'clock in the morning; the doctor called me up by 'phone from Racine, and I advised him to bring his patient here at once. He brought the patient at once to Chicago, and I operated at 11 o'clock. Although he had no elevation of temperature and a leukocyte count of only 7000, he had acute sensitiveness in the appendiceal zone, and the appendix was full of pus and congested. The reason he did not have elevation of temperature was that the products of infection were not being absorbed into the circulation, but were leaking back into his caput coli, and the findings fitted perfectly to the symptoms.

This morning, with all our interpretations, as far as we know, this man should have an infection of his appendix, with edema and swelling of the appendix. Let me cite one case—and the more experience we have the more cautious we are about interpreting what else may be present, with the degree of absorption or with the degree of comparative normality of the appendix existing at the time of the operation. You can make a diagnosis of appendicitis in the earliest stages, but you had better not try to interpret the degree of pathologic disturbance in the appendix, because if you do you will suffer many humiliations. Make the diagnosis, operate on that diagnosis, and never mind the pathologic condition of the appendix. I will cite one case: I was called to the 'phone one evening at 8 o'clock by a doctor who stated he had a patient, a male, with a history of an acute, sudden, severe, intense pain in the abdomen which began in the morning at 8 o'clock. I was tired, and the case looked as though it would safely go over to the next day—about twenty-four hours in all since the onset of the pain. Never, or rarely, is there a perforation of the appendix or leakage of the contents of the appendix into the free peritoneal cavity inside of the first twenty-four hours except in cases of peritonitis from primary appendiceal perforation from stone. It was not a safe thing for me to postpone the operation. That night he had a pulse of 110 and a temperature of 104.5° F. I saw him at 8 o'clock the next morning and his pulse was 84 and temperature 99° F., and the man did not want an operation. I urged that he had appendicitis, and that he should have an operation notwithstanding his freedom from symptoms. He was a little sensitive on percussion. He accepted my advice and went to the hospital, and on opening his abdomen, what did we find? When that temperature went back to normal, I interpreted it as indicating that the appendix was draining back into his caput coli, but when I opened the abdomen, out popped a completely gangrenous appendix. Why did the symptoms subside? Because a dead appendix does not absorb nor does it cause pain. It was perfectly free in the abdomen, and it had died so quickly that it did not form adhesions to anything. It looked like a black rubber finger-cot

filled with syrup. We lifted it out; the line of demarcation had completely formed, but suppuration had not taken place. That has made me more cautious about interpreting the sudden amelioration in symptoms. That appendix caused no elevation of temperature because with its death absorption ceased. Temperature elevation is the manifestation of absorption. That man had the most dangerous impending condition which he could have in his abdomen. I am cautious now in interpreting what I find, but the diagnoses are based on the same principles.

This man is very sensitive in the right iliac fossa. He had a chill. When they begin with a chill, I am much more apprehensive, because that shows that the type of pus that is present is the type that is rapidly disseminated through the lymphatics. This would cause the chill. The local infiltration will not be at all as great, but the danger to the whole body is greater. In operating on patients who have a chill, don't tear up the adhesions; if you find a pocket of pus, put in a tube and get out, because I know from that chill that we have a type of infection that the patient is not resisting, and he therefore must be kept from absorbing more than the smallest possible amount of infective products. You tide him over. One of the important things in medicine is to learn to individualize your cases and to learn just why certain things can or cannot be done, with the prime idea that you must get that appendix out at the earliest moment.

At the meeting in Budapest, 1909, where the subject was up for discussion before the International Congress, we had a very peculiar incident cited. A medical man came from Lausanne to talk on the subject of appendicitis, and one of the suggestions he made was that the abdomen should be punctured in the neighborhood of the appendix before operating to see if pus was present. That was only three years ago, and the irony of it all was that he came from the town where the first great work on surgery of the appendix was done by Kraft, also of Lausanne; he was the first surgeon to grasp the subject of appendicitis, and the first man who grasped the medical aspect of appendicitis was

Fitz, of Boston, and he insisted that it was a surgical disease. The point that Kraft made was that in perityphlitis, as the disease was known then, the pus was outside the appendix, came from the appendix to the outside, and should be liberated as in any other type of abscess; and then so many years after—twenty-one years—a man tells you that you should puncture the abdomen in the neighborhood of the appendix to see if pus is present, which shows that he never visited his neighbor's clinic or he would not have advocated that method of procedure. The statement which we made there was that every case of appendicitis that came for operation with pus outside of the appendix had in that fact incontrovertible proof that the case was inefficiently managed up to that time.

The diagnosis of appendicitis can be made better in the first twenty-four hours than later and the operation is easier.

Here is a case where you put a great big interrogation point after the diagnosis because it has had an exceptional course.

In making the incision for appendicitis we always go through the outer margin of the right rectus muscle. Divide the aponeurosis of the rectus, and displace all the muscle-fibers inward, so that the line of division of the fibers and the line of division of the aponeurosis are not overlying. That makes for a stronger abdominal wall afterward and makes the occurrence of hernia less likely.

The urine in this case was negative. The doctor reported on it while we were talking and it was negative.

The next is to pick up the peritoneum with two tissue forceps: but do not cut between the two forceps: cut on the incline made by the elevation. If you cut on the incline, you cannot cut the intestine at all, and you can cut it if you divide the peritoneum on the incline, between the forceps, provided the forceps hold the intestine under the peritoneum. After the peritoneal cavity is opened, the next thing is to endeavor to locate the appendix, and we do that by passing the finger outward along the anterior abdominal wall, then swinging it over the iliac vessels and up on the inner side of the iliac artery, where one hooks up the meso-ileum and elevates it

or the colon into the incision. The meso-ileum is the most uniformly fixed tissue in the right iliac fossa. The meso-ileum is the fixed structure in this neighborhood. As I sweep my finger around under the colon, I bring out the appendix without adhesions. Isn't that a beauty? It is acutely infiltrated, distended, edematous, and fiery red. See the length of it! That is the time to pick them: pick them while they are green and don't wait until they are ripe. There is a case that in all my experience still left me in doubt as to the pathology. Now we come to the conclusion that the lesion is an appendiceal lesion. I do not know why he has not had certain symptoms, but this appendix shows us why he had the chill. See that thickened, infiltrated mesentery! That is why he had his chill. That is the best case we will have today as a life-saving proposition and as life-saving propaganda, because it shows you how these things have to be handled early in order to keep on the safe side, from the patient's standpoint.

We amputate the appendix in the usual manner, sterilizing the stump with 95 per cent. phenol. I want to show you how to cover that mesentery. I treat all these cases in the same way. There are both layers of the mesentery of the appendix. I will pass my needle through the one layer on the right, then on through the layer on the left, and then come back and make an overstitch. The overstitch first ligates the vessels, then comes through and approximates that peritoneum from both sides. Now I have a continuous circle of peritoneum for primary adhesion. We have from the beginning considered the opening made in the intestine by amputating the appendix the same as a bullet wound of the intestine, and we close it with exactly the same precautions.

We are back to the starting-point of that stitch. It is not pulled taut. It is going to be a little difficult to invert this appendix because of the thickness of the mucosa from the acute swelling, but still we will be able to invert it. We now put in the puckering-string suture in the base of the caput coli, the appendix stump being in the center of the loop of the suture.

You will have noticed how I pushed the infective contents

of the appendix upward with the hemostat. I milked it up, and then ligated the appendix in the line where I crushed it with the hemostat. I want to keep the forceps on the appendix until we make a smear and a culture of its contents, and also from its wall. Then I amputated it and touched the stump with 95 per cent. phenol. I do not neutralize it, because I am going to turn it in, and it will take care of itself. The next step is to pull taut the purse-string suture and invert the appendix. The doctor inverts that. The next step is to put in a top stitch. It is put in as a Lembert stitch. That puckering-string is also a Lembert stitch.

Now we have closed the end of the intestine. We will put an extra ligature on the mesentery, because it is necessitated by this little spurting vessel.

Now we will look over the field. It is perfectly dry and clean. The next step is the closure of the peritoneal opening with catgut, and that closure is always done in a definite way, no matter what the operation is for. We produce an ectropion of the divided edge of the peritoneum, turning the cut edge out into the wound in the abdominal wall. That avoids peritoneal or intestinal adhesions at the line of operation, and that is a very important factor in every abdominal operation. Adhesions produce symptoms of distress and discomfort that the patient is entitled to be without, and that we can avoid, as we have for many years, by the use of this method of suture.

Each stitch is put in beneath the edge, from the under side, so as to turn the cut edge out, and the last stitch is put in as a puckering-string. That closes the peritoneal cavity. Now, we locate the lower and the upper angles of the wound by catching the aponeurosis of the rectus with hemostats. You can see that aponeurosis standing out there. Then we make an edge-to-edge suture union of that. Just unite it edge to edge. That gives us the best type of closure—an edge-to-edge union of similar histologic elements, a law which we laid down when we wrote our first article on the use of the button. It lessens the danger of stretching, and, on the other hand, of contracting, which has the danger of annular cicatrices that cause stenosis.

I want the intern to read that history again, so that we can check it up with the pathologic findings.

[Intern reads.]

DR. MURPHY: The patient does not just get the question of nausea. He is a German, and I asked him if he had "Übel." He was not so certain about that, but he did not have a marked tendency to vomit; that was certain.

(To intern): The Labor Day attack was not associated with a chill?

THE INTERN: No, doctor.

DR. MURPHY: Put that in the history. Then it was not a "similar attack." The chill makes a very great difference. His urine was examined and found negative; no blood. That was after riding three or four miles to the hospital.

Next we insert four or five silkworm-gut figure-of-8 sutures, which will approximate all the structures and obliterate dead spaces.

We close the skin with horsehair and then we will show you how we put on the gauze splint to prevent the figure-of-8 sutures from doing mischief by cutting through the skin. The gauze is laid folded on the wound, and the sutures are tied over it. The collodion gauze is put on over that and seals the wound.

Now let us go over the diagnosis and the things that are absent. We laid down a syndrome of symptoms for appendicitis —pain, nausea, vomiting, local sensitiveness, elevation of temperature, and leukocytosis. We never interpret a case as appendicitis that has temperature preceding the pain. I impress on you the significance of the order of the symptoms. One of my patients, many years ago, was sick from Friday, feeling badly the week before, but worked every day; but on Saturday night, after work, she went to see a doctor. She was a girl about twenty years of age. The doctor examined her, took her temperature, and it was 102.5° F. on Saturday night. She had no pain at all. Tuesday afternoon at 3 o'clock I saw her, and she had a temperature of 103.5° F. and had pain in the right iliac fossa that day; she had nausea and vomiting that day, and local sensitiveness with the elevation of temperature. It looked like

a clean-cut case of appendicitis to me with my then rather limited experience of 100 or 200 cases. But she had a temperature before she had the pain. Pain in the appendix is a manifestation of the swelling of the infected mucosa, and its strangulation by the inelastic fibers and muscular coats and peritoneum of the appendix wall. Nausea and vomiting are merely reflex evidences of that strangulation. Elevation of temperature is the manifestation of the absorption of the infective products. You cannot have that absorption from the infection before the swelling appears. That tells the story. We operated on that girl, opened the appendix, which was very much distended, and found an ulcer of its mucosa. There were also innumerable typhoid ulcers all over the small intestine. The ulcer in the appendix was a typical typhoid ulcer. Since that time we have had 9 similar cases; the first 3 were operated—this was before the days of the Widal test; 6 were not operated. All the patients got well,—those that were operated and those that were not operated,—but we put an additional tax on the patients by operating. It is not advisable to operate on patients having typhoid ulcers in the appendix, notwithstanding there are a number of cases in the literature where the typhoid ulcers have perforated the appendix, for the number is not great enough to add the danger of an operation to an already serious disease.

In all the other cases I was able to get a history of temperature preceding the pain. The moment we obtain this fact that settles the diagnosis so far as simple appendicitis is concerned, and I cite that exceptional case because it puts us on our guard when the course is atypical, as it was in this particular case.

That is the method in which this wound is closed. First unite the peritoneum, turning the edges out. Next unite the aponeurosis, edge to edge; then put in a figure-of-8 silkworm-gut stitch. The lower loop has the aponeurosis of the rectus and the upper has all the space between the rectus and skin. After that is completed and the skin is closed with horsehair, we put over that a fold of gauze. The lower loop of the figure-of-8 stitch, when it is tied, pulls the aponeurosis close to the skin and obliterates the dead space. In that way we get better union and

have a nicer course for the patient. This stitch is not original with us. It was used by Dr. Ill, of Newark, N. J., but he included all of the abdominal wall in the figure-of-8.

Over this we put on the usual abdominal dressing, which is held in place with adhesive straps and a binder.

Let the record show that Sister Victorine reports the sponges counted and correct. The sister is responsible for the sponges, and the intern is responsible for putting it on the record. If we are doing a laparotomy we always ask whether the sponges are all out.

ABSCESS OF NECK

HISTORY

PATIENT, male, aged twenty-five, comes to hospital on account of swelling over the right wing of the thyroid cartilage.

Patient first noticed the swelling three weeks ago; while undressing one night he found that his collar-band was tight. The following morning he noticed the swelling. In May, 1911, he was throttled, and his neck was severely bruised and scratched in the thyroid region. It was tender and sensitive for ten days, but this condition gradually subsided.

Examination shows a swelling to the right of the median line of the neck, about the size of a pigeon's egg, extending from the hyoid bone down to the cricoid cartilage. Mass is fluctuating, but quite tense. About a week ago it was aspirated and a small quantity of creamy pus was removed. Patient has had no symptoms of an acute infection, no carious teeth or enlarged glands. Great cornu of hyoid bone is broken on right side.

COMMENTS AND OPERATION

DR. MURPHY: This case is an interesting one. It involves peculiarities that are not at all common. The history of the case was that he had a trauma seventeen months ago, and that his neck did not begin to swell until about one month ago. One of the first things one thinks of in connection with a trauma in this region is fracture of the thyroid cartilage. He had no temperature; no chill; no evidence that he expectorated blood at the time of the injury; no evidence that his cartilage was fractured through the mucosa to give him the infection.

The next thing you think of is the thyroglossal duct, and that this may be a cyst of the dermoid type. After you have eliminated these two conditions you consider aberrant thyroids,

namely, those that are situated along the normal anatomic tract of the thyroglossal duct in the embryo. You know that occasionally remnants of the thyroglossal duct are arrested all the way down this tract; that some remain in the middle, some are displaced to the side and remain away up under the tongue, and we occasionally have developed, as a sequence of that, first, a dermoid cyst lined with epithelial cells; second, an enlargement of the duct extending down from the foramen cæcum. Often it is lined with columnar epithelial cells from the mouth—a mucous lining. Third, a cyst shut off both above and below—a typical dermoid. That is a remnant of the thyroglossal duct and it is lined with epithelial cells. Fourth, there are developed in this tract the various changes that occur in the thyroid when it is in the normal position, namely, a sublingual goiter, a hyoid goiter, and a goiter anterior to the larynx. The sublingual goiter is the most common type. Occasionally, when that undergoes its goitrous change, only a portion of the thyroid remains. You enucleate that gland, and to your horror and surprise, in five or six weeks the patient commences to develop a myxedema. I will never forget my first shock in that type of case. The goiter developed beneath the tongue. We enucleated the mass, and when I cut into it I saw it was thyroid tissue. Then I commenced to look for the remaining thyroid and could not find any. We kept her in the hospital for a while until she commenced to develop an edema of the lips and of the hands. She got a typical myxedema, showing that I had taken out the only thyroid tissue she had. We put her on desiccated sheep's thyroid. All her symptoms disappeared at the end of six months; then we skipped a week, and then a little longer, and in fourteen months she was completely off the thyroid medication; either she had developed some thyroid cells somewhere, or she had some compensating cells. However, all the symptoms disappeared.

When this patient came here we had a significant connection element, the trauma, which made us fear that it was a malignant sequence of the trauma. This condition began suddenly and without any apparent connection with the trauma. We aspirated it the day he entered the hospital, about a week ago, and

the fluid contained a few lymphocytes, a large number of polymorphonuclear leukocytes; no bacteria were found in the smear and no evidence of tuberculosis. It is, therefore, an acute infection, possibly through an involuted portion of the mucosa that resulted from a fracture of the larynx by the trauma. There is no connection with the larynx in this case because there is no discharge into his throat at all. The suppurative focus is apparently completely encapsulated.

We will freeze the skin with ethyl chlorid, which is the ideal anesthetic for these cases. Then we will expose the enlargement by a small transverse incision. This is suspicious of a dermoid condition. This infection is probably simply a coincidence in connection with the trauma. We will completely enucleate the sac, for such it is. It is filled with a gelatinous material which makes me fear that it is a dermoid, although the microscopic findings do not warrant that conclusion.

We will put in a small rubber tube drain for a few days or a week. The bleeding has stopped; only a few points of hemorrhage had to be ligated. We will close the wound with three or four horsehair sutures and put on a plain dressing.

[The drainage-tube was removed on the fifth day. The wound healed rapidly, the patient leaving the hospital on the fourteenth day.—Ed.]

BROAD LIGAMENT ABSCESS; PYOSALPINX

HISTORY

PATIENT, female, aged thirty-five, comes to hospital on account of pain in the left and the right iliac region.

Present trouble dates from last July (five months ago), when the patient had a miscarriage during the second month of pregnancy. Preceding the miscarriage she had slight uterine hemorrhage with painful contractions. Two days after the onset of these symptoms the uterus was cureted. That night the patient had a temperature of 103° F., which continued with slight fluctuations for two weeks. The day following the curetment the patient had severe pain in the right iliac region, accompanied by marked rigidity and tenderness and vomiting, which continued at irregular intervals for four weeks. One week after the onset of pain in the right side pain was also present in left side. This was followed the next day by general abdominal pain and rigidity. No vaginal discharge followed the curetment. During the second week of her illness the patient had one or two blood-tinged bowel movements. At the end of six weeks all her symptoms had subsided, but soreness was present over left and right iliac regions and occasionally in the lumbar region. Pain now seemed to be located in the hips and lumbar region and was aggravated by walking. The pain has been continuous since the illness. For the past eight or nine days patient complains of sudden, sharp pains across abdomen, which persist only a few seconds. Has vomited every day for the past eight days. Immediately after eating, usually the evening meal, the patient feels nauseated and vomits. No pain at the time. Complains of two tender areas—one in right and one in the left iliac region, the latter being the more severe.

COMMENTS AND OPERATION

DR. MURPHY: What is the matter with her?

INTERN: Following that miscarriage she had a pelvic abscess.

DR. MURPHY: What do you mean by that?

INTERN: She had an infection of the uterus, and the infection traveled from the uterus to the tubes and then into the peritoneum. That accounted for the temperature, pain, and rigidity.

DR. MURPHY: Why do you think so, doctor?

INTERN: If she had a vaginal discharge before the miscarriage, I would think it was a Neisserian infection.

DR. MURPHY: I think there was pus in the tubes, on account of the presence of tenderness. When did that begin?

INTERN: Last July.

DR. MURPHY: Following the miscarriage?

INTERN: Yes.

DR. MURPHY: She had pain where?

INTERN: First in the right, then in the left, iliac region. The pain in the right side disappeared when the pain in the left side began. She had abdominal rigidity and temperature.

DR. MURPHY: She had fever. She first had a chill and then a temperature and then pain. What is the matter with her?

INTERN: She had an infection in her pelvis.

DR. MURPHY: That is very fine. You might as well say when a patient had a purulent synovitis of the knee that she had an infection in the lower extremity. That is too indefinite.

INTERN: She had an infection in——

DR. MURPHY: Wait a minute. She had pain in the right iliac region and it disappeared promptly from the right side and began in the left. What is the matter with her? First, she had a chill, then fever, and then pain The pain shifted from the right to the left side. What is the matter with her?

INTERN: She has a tubal infection.

DR. MURPHY: It is an infection of the uterine surface and goes where?

INTERN: Into the Fallopian tubes.

DR. MURPHY: No, it does not. It goes into the Fallopian

tubes in a Neisserian infection, but rarely from a post-abortion infection.

INTERN: It travels through the lymphatics of the uterus.

DR. MURPHY: To where?

INTERN: To the peritoneum.

DR. MURPHY: Go on—the lymphatics going from the uterus to the peritoneum——

INTERN: It goes to the muscles.

DR. MURPHY: No. What is the matter with her? If you have an infection of the finger, where does it go—to the muscles?

INTERN: It goes to the lymphatics and then to——

DR. MURPHY: To the cellular tissue in the forearm. In this case where does it go? It goes to the cellular tissue of the broad ligament and then what happens?

INTERN: An infection of the cellular tissue of the broad ligament, and that may go on and form an abscess.

DR. MURPHY: That is a typical history of a pelvic cellular infection from a curetment following a miscarriage. The infection was on the surface of the uterus, passed through the lymphatics in the cervicocorporeal portion of the uterus, into the cellular tissue of the broad ligament, produced edema, swelling, and probably necrosis and abscess formation. I can swing the uterus to the right side, but not to the left side. I put in an aspirating needle through the vagina yesterday and drew out pus. How am I going to take out that pus center? How would you treat it, doctor?

INTERN: I would go through the peritoneum into the broad ligament.

DR. MURPHY: Then she would get a peritonitis and die.

INTERN: I would put in a vaginal drain from below.

DR. MURPHY: How would you do that?

INTERN: Put it into the culdesac.

DR. MURPHY: What would you do with the round ligament?

INTERN: I would drain it from beneath.

DR. MURPHY: What happens when you drain a pus-tube?

INTERN: It fills up again.

DR. MURPHY: What happens when you drain an abscess in the broad ligament?

INTERN: As soon as you take the tube out it fills up again.

DR. MURPHY: Why?

INTERN: Because there is some of the infection left behind.

DR. MURPHY: What happens when you drain a phlegmon of the thigh?

INTERN: It is healed.

DR. MURPHY: What happens in the broad ligament?

INTERN: It contains connective tissue and——

DR. MURPHY: It heals too. What happens when you drain a tube?

INTERN: It refills.

DR. MURPHY: Why?

INTERN: Because it has a mucous lining.

DR. MURPHY: And its fimbriated end is closed and its uterine end is usually closed, and with an infected mucous membrane in between, what must happen? A refilling of the tube with pus. I want you to say that this is an abscess in the cellular tissue of the broad ligament. It does not require a laparotomy; it needs to be opened from below, if you can do so properly. But it is in the broad ligament, which is ordinary connective tissue, and all we need to do is to drain. When you have an abscess in the Douglas pouch all it needs is drainage. When you have a tubal infection, a drain does not do any good because it is an infected mucous-lined surface. That is what I want to bring out. It is not a pelvic infection. Its clinical course is just as clean cut as is that of an infection of the thigh.

OPERATION

(the following day)

DR. MURPHY: Did she have a chill when she had that attack?

INTERN: No, doctor. She had fever from the second day.

DR. MURPHY: Did she have a rigor the night preceding the onset?

INTERN: She does not remember. She cannot remember ever having had a chill, but she remembers the fever.

DR. MURPHY: She must have had a chill. That type always begins with a chill. You will see that she had fever on the night of the curetment—not on the second day after, but on the night of the curetment. From that curetment, what else should she have had?

INTERN: Temperature that night and——

DR. MURPHY: Temperature that night and pain first on the right side and then on the left side. The pain in the right side disappeared when the pain in the left side began. What is the matter with her?

INTERN: She has a pelvic cellulitis.

DR. MURPHY: The doctor was over this case yesterday and he has a better grasp of the subject today than he had then. Let me see if you know what caused the pelvic cellulitis.

INTERN: The miscarriage first and then the curetment and——

DR. MURPHY: That leaves the uterine surface raw and open to infection. That is just what the curetment does. When you scrape the surface of the uterus, you open up the lymph-spaces. When you open the lymphatics into the broad ligament, one of two things may occur in the broad ligament: First, great edema and swelling. The edema goes through a course of a number of weeks and an abscess forms in the ligament; second, the infection is carried into the broad ligament, and an abscess is formed in the cellular tissue of the broad ligament, accompanied by continued fever persisting for weeks.

When I was in the Cook County Hospital we had a great number of these cases as a result of curetments and abortions. When you examine the uterus in these cases you will find you cannot move it in any direction. The Germans say it is "eingemauert"—set in masonry—it is so immovable. It is just the opposite in this case. There is a mass in the left side, well back. The reason I am going to go through the abdomen is that I do not want to hazard the ureter. We open the abdomen in the usual manner, going through the right rectus muscle. There is the tube. This differs from the usual type of infection of the

tubes. She may have a tubal infection connected with this, but it does not feel like a tubal infection. In tubal infections the infection occasionally passes from the uterus into the other tube. It may endeavor to go from the tube into the peritoneum by rupture of the tube or patency of the fimbriated end, and occasionally from the tube it passes into the Douglas pouch, but that is very rare, because when you get an infection in the tube it usually seals its end and retains the infection, so that it becomes a pus infection of the tube only. The infection does not drain back into the uterus and it becomes a pyosalpinx. That is just the opposite of what takes place in a Neisserian or gonococcus infection. In the staphylococcus and streptococcus infections the mucous infiltration temporarily blocks the tube at the uterine end without developing a stricture. With the Neisserian infections there is temporary blocking with finally a stricture developing at the uterine end of the tube, just as it does in the male urethra.

In examining the patient yesterday I looked for this infected zone from below. I went behind the insertion of the ureter and succeeded in aspirating some pus, thus taking off the tension. A large quantity of pus was withdrawn. Now, when you open the abdomen in these cases, what are you going to do? It depends on what you find. If the infection is in the broad ligament, the abscess is in the cellular tissue and all you have to do is to put in a drain. If it has passed into the tube, then you cannot drain. If it has gone through the tube and the tube rests on an ovarian follicle, it can infect it, and you can have a typical tubo-ovarian abscess.

The abscess appears to be situated anteriorly. I shall try to get into the Douglas pouch without opening any adhesions or fixations that have formed. The abscess is in the left broad ligament. There is the tube. There is also an infiltration in this uterus, but there is the abscess in the broad ligament. I will see what disposition I will make of this tube.

There is no history of a discharge of pus through the bowel. I am endeavoring to get hold of the fundus of this uterus. Here

is the fundus of the uterus. This tube is infiltrated. Whether it is an infection or merely an agglutination I am unable to tell until I go in farther.

There is the appendix adherent to the surrounding organs. This tube will have to come out because it is wrecked as a tube. The fundus of the uterus comes right up into the field. I would say that this was a colon bacillus infection, from the appearance of it. We will have the pus examined for Neisserian infection.

Now we come to a more difficult situation—the tubal involvement. There is the wall of the pelvic abscess. I do not intend to take that out. Now we will commence to enucleate this tube. This tube has pus in it, and it has an offensive odor that suggests the colon bacillus infection. The other tube is also infected.

Here is the abscess in the broad ligament. Now we will clean it up. There is the end of the tube. Swinging it out we come on to its abscessed wall. See! we are right up into the cornu of the uterus. We will remove both tubes. I am opening the abscess at its upper pole, and then we will put in a drain. You see why I am not trying to take "a sac" out of this broad ligament. We do not take out the sac, but treat it just as we do an abscess in the thigh.

Let the record show that she had an abscess down in the pelvis and that the pus had an offensive, colon bacillus odor. Neither of the ovaries was removed, but both tubes were removed. Both tubes were infected. There was a double abscess in the left broad ligament, no abscess in the right broad ligament. With its clinical course we are unable to say whether these infections in the tubes, one with a colon bacillus odor and one without, are of Neisserian origin or not, but I would say they were not.

Let the records show that Sister Victorine reports the sponges counted and correct.

That is a very interesting case in its clinical findings. If she had not been cureted, she would not have had that broad-ligament trouble.

We close the abdomen, securing the drain with a silkworm-gut fixation suture. The peritoneum is closed with catgut, its edges

being everted to prevent the occurrence of peritoneal adhesions. The rectus fascia is likewise sutured with catgut. Silkworm-gut figure-of-8 sutures and horsehair skin sutures complete the closure. The wound is dusted with bismuth subiodid powder and sealed with collodion gauze. The usual dressing is put on.

[At the time of reporting this case the patient was still in the hospital. The wound was draining well. The patient was comfortable. No temperature.—Ed.]

CEREBRAL ADHESIONS (DECOMPRESSION)

HISTORY

PATIENT, a male, aged thirty-four, comes to hospital on account of difficulty in speaking and numbness in right hand and leg. Present trouble dates from an injury twelve years ago, when he was struck in left parietal region with a heavy iron bat. Remained unconscious for several minutes and bled profusely. On regaining consciousness he felt dizzy and weak and had difficulty in talking. He complained of numbness in right hand and foot—could not feel a pin-prick. Four days following injury his skull was opened and one piece of bone removed. Following the operation he had no difficulty in talking and numbness disappeared. Remained well until three months ago, when he struck the left side of his head against a tree while riding horseback. Was not unconscious. Complained of dizziness all day, and on the following day he could articulate with difficulty. The right hand and foot became numb. Could not hold objects in hand.

Previous Diseases.—Had typhoid last summer—three weeks type. Gonorrhea at age of twenty-two and also at present. Chancre at twenty-two. Six months after had nocturnal frontal headaches. No sore throat, no rash. Headaches disappeared after six months of mercury treatment.

COMMENTS AND OPERATION

DR. MURPHY: Dr. Mix, will you kindly take up the history of this case? This is a very interesting case.

DR. MIX: The question in this case is whether this man's trouble comes from an old fracture of the skull or whether it comes from an injury sustained many years after the fracture.

The patient is a cowboy from Arizona, and is thirty-four years

of age. Twelve years ago he had a fracture of the skull. The left parietal bone was caved in, but the bony fragments were removed and the wound healed without causing any symptoms whatever. He was normal in every way except one; he had a vulnerable point in his skull. In time the unprotected spot was injured.

Two or three months ago, while riding swiftly on his horse, it ran into a tree and he was thrown to the ground. Within two or three hours' time symptoms presented. At the time of the original injury the skull healed in such a manner as to leave a bridge of bone across the large indentation, thus dividing it into a larger anterior area and a smaller posterior one. At the time of the last accident the patient believes this bridge of bone was depressed, and he is certain that it is now more depressed than it was before the accident.

As I said, within two or three hours' time his speech was disturbed, and gradually this disturbance has become more pronounced. The disturbance is a dysarthria, and it is apparently general, since his labials, linguals, and gutturals are equally affected. If anything, his dysarthria is growing worse rather than better.

Besides the dysarthria, he complains of clumsiness and possibly a mild degree of weakness in his right arm. He says he can walk reasonably well.

Physical examination shows normal ankle- and knee-jerks. There is no Babinski reflex on either side. The abdominal and epigastric reflexes are present. The cremasterics are active. The pupils are equal, round, and react to light and accommodation. Strength in the arm and leg on the right side is normal. There is no paralysis or paresis. The tongue is protruded straight, but seems to show a possible atrophy on the right side. Aside from this very doubtful atrophy on palpation, there is no atrophy elsewhere. There are no spasms or convulsions, and no history of either. There are no contractures. His memory is not quite so good as it was before the last accident.

The storm center in this case, then, seems to be over the left hypoglossal center, leading, by irritation of it, to dysarthria. The

clumsiness in the right hand might be ascribed to irritation of the superficial cells over the hand center, without disturbance of the deeper-lying motor pyramidal cells. The absence of motor irritative phenomena, such as Jacksonian epilepsy, general epilepsy, and contractures, suggests a very superficial lesion, except at the hypoglossal center. The dysarthria is suggestive of more cortical irritation here than elsewhere.

The diagnosis, as we have made it, is cortical irritation, superficial, over the right hypoglossal center. Whether the pathology is merely a thickened dura, or whether there is some actual compression by the bony bridge, or whether there is a subcortical cyst, remains to be settled when the skull is opened. Against the latter contingency is the grouping of the symptoms.

EXAMINATION OF EYES BY DR. RICHARD J. TIVNEN

(1) *Vision:*
O. D. } 20/20ths.
O. S. }

(2) *Position of Eyes:* Normal.

(3) *Excursion:*
(*a*) Lids. }
(*b*) Globe. } Normal.

(4) *Pupils:*
(*a*) Pupils of both eyes, regular; slight mydriasis of right.
(*b*) Reactions:
(*a*) Direct light. }
(*b*) Consensual. } Normal both eyes.
(*c*) Accommodation and convergence. }

(5) *Fundi:* Normal.

(6) *Fields of Vision for Form and Color:* Normal.

DR. MURPHY: The history of the injury dates back how far?

INTERN: To the age of twenty-two, twelve years ago.

DR. MURPHY: Has he ever had any symptoms since?

INTERN: No.

DR. MURPHY: This is a peculiar case. I do not know how these head injuries act on the brain, but I do know how other injuries often produce diseases of the joints in tabes. A man will have a lesion in his joint, and go on comparatively comfortable until he has a trauma. After that he will readily develop a Charcot joint. Usually a Charcot joint is associated with the

other symptoms of tabes. This man has nothing like that, however. The joints have no relation to his other trouble. It is interesting to see how long these patients can go on without any considerable inconvenience. He has no convulsions, epilepsy, or headaches. The symptoms that usually follow injuries of this kind are: (1) Headaches; (2) attacks of vertigo; (3) epileptic convulsions.

I remember one case that I treated. A baby fell out of the second-story window. The boy was unconscious for three weeks, but had no trouble after that until he was twenty-two years old, when he commenced to have his typical epileptic convulsions. We trephined his skull and relieved his headaches, but did not cure his convulsions. The convulsions are going right on and commencing to become more violent.

We have to interpret the clinical history of this case either as Dr. Mix does, that it is due to the original injury twelve years ago, or that it is due to the last injury sustained two or three months ago. We have in this case some new conditions to deal with. First, he has in the middle of the involved parietal area a depressed linear scar about three inches long, with an almost corresponding absence of the skull. The dura is firmly adherent to the edges of the bone. The dura was evidently lacerated in the original injury, so that, first, we cannot make our flap as conservatively as we would like to, and, second, we cannot take out the bone, because when I come to the central part there is liable to be considerable hemorrhage.

We will make the usual horseshoe-shaped incision, so as to include in it this entire area over the left parietal bone. That flap will measure five inches in diameter. We secure hemostasis in this case by means of deep sutures in the scalp. We are going to remove as little of the skull as we possibly can. I want to make a large osteoplastic flap. The only way good brain surgery can be done is to make a large flap. The trephine is used first to make the opening into the skull, through which we can start to cut out the osteoplastic flap, for which purpose we use the bur. We are not having much difficulty with the bone portion of the work, but we must be very careful in freeing the dura from its

adhesions. The dura is very thick. It is a mass of cicatricial tissue. There is no pulsation. See how white it is! One is impressed with that fact at once in taking out the button of bone with the trephine. The button did not come out as quickly as it should. I apparently struck against the adherent dura on the under side, and it retarded the drill. When we were East we saw a number of these bone drills, but I did not think that any of them worked as well as this machine. It was originally worked out by my associate, Dr. Neff.

I am blazing the way for the fracture of the base of this bone-flap, not cutting the soft parts but cutting into the bone enough to try to make it break on this line. The soft parts will act as a hinge. I am trying to get that dura free down there so as to tear it as little as possible. Now I have it freed, and we can break the bone. I did not go through the dura. That is just fine! We break this bone very carefully, because we want to preserve it to fill in as much of the defect as possible.

The dura is not pulsating. It is, as I said, a mass of cicatricial tissue. Whether there is a cyst present or not I do not know. We will not remove any of that dura because we have a defect in the bony portion of the scalp. If we did not have that hole there, we would take out that thickened dura. I will incise the dura, however. There is no cyst connected with the fracture. Here is something! All the resistance ran just across that line—the ascending parietal convolution. I will puncture the brain here with a brain needle. I despise brain needles, yet sometimes I must use one. That did not strike anything resistant—nothing like a cyst. I will change my original plan and take that dura out, because there is enough left to give me a good flap. The brain pulsates now, but the convolutions are flat. The blood-vessels are full. The brain is slightly edematous over the ascending parietal convolution. We will cover this denuded area with gaudaphil, a cellulose tissue.

Let the record show that the dura was enormously thickened and adherent in the position where the bone had previously been fractured, but there were no adhesions between the dura and the pia; that the brain appeared to be edematous; that it did not

offer great resistance to touch. A single puncture was made with a small needle; no additional resistance was noted, and no fluid escaped when I removed the stilet. There was no hemorrhage from the dura when it was incised, as it was a white, firm, cicatricial mass. The dura was opened and a piece about three inches in diameter was excised and the defect covered with cellulose paper. We know that excision of the dura gives greater relief from the convulsions than anything else, but whether he will get relief from the type of trouble that he has I do not know. What a decompression will do here remains to be seen. We will replace the bone and tissue flap and suture the soft parts with silkworm-gut and the skin with horsehair.

The tension, remember, is all carried by the silkworm-gut, but an accurate approximation of the scalp is accomplished by the horsehair. All this will be covered again with a bony covering, as nature intended it should be. The wound is dusted with bismuth subiodid and sealed with collodion gauze. The final dressing will be a starch head-piece, because it is light and can easily be removed to make later dressings.

[Following operation there was a transitory mono-paralysis of the right arm and considerable increase in the speech disturbance, lasting for three days. Then improvement began and continued rapidly. Fifteen days after operation the right arm could be used with perfect ease. Speech is considerably better than it was at the time of the operation. We expect an entirely good result.—Ed.]

FRACTURE AND LUXATION OF THE NECK OF THE HUMERUS

HISTORY

PATIENT, male, aged twenty-one, comes to hospital on account of inability to use left shoulder-joint following a fracture.

August 4th (two months ago) the patient was flying his biplane, when something went wrong with the engine. He shut it off and volplaned to earth. He landed near a barbed-wire fence and ran directly into it. The machine was stopped by the fence, but he and the gas tank were thrown over the fence. He struck a chicken-coop and fell to the ground, landing on his left shoulder. Pieces of the coop and gas tank were on top of him. He was unconscious for fifteen minutes. When he regained consciousness he had an aching pain over the upper third of the humerus. He was unable to move the arm; no pain in shoulder; few scratches about head and back and other minor injuries. He was taken to a hospital, where the trouble was diagnosed as a backward dislocation of the humerus and a double fracture of the scapula. He was anesthetized, but does not know what was done. When he woke up, the shoulder was bandaged so tightly he could scarcely breathe. Over this was a wire-screen cage. The arm was in a sling, with the elbow bent at a right angle, and forearm midway between pronation and supination. Ten days later the dressing was removed and the shoulder looked normal. The doctor then strapped the scapula with adhesive and the arm was held tight to the thorax with adhesive, the elbow and hand being free. Five days later he was examined again, and this time there was a bone protruding just behind the shoulder-joint, which the doctor found difficult to diagnose specifically. Advised massage.

COMMENTS AND OPERATION

DR. MURPHY: What was the diagnosis at that time?

THE INTERN: Backward luxation of the humerus and double fracture of the scapula.

DR. MURPHY: We have taken many skiagrams of this case,—I think six,—and at all sorts of angles. In one skiagram the head of the humerus appears to be out of the glenoid cavity; in another it appears to be in the glenoid cavity; in a third it appears to be partially out. When you look at the patient, it appears to be behind the line of the articulation, which shows the difficulty of interpreting skiagrams. There is no doubt that he has a fracture of the upper end of the humerus which incapacitated his arm. It hangs down by his side, and he can do nothing with it. His muscles are not at all paralyzed, so it is a lesion of the head and neck of the bone. As for the scapula, if anything, one might think, from examining one skiagram, that he had a fracture of the scapula. In another the scapula looks normal and does not deviate at all. It is difficult to figure out the scapula because the distance between the head of the scapula and the acromion is too great. We are unable to get a definite bearing. It looks as though it was fractured obliquely. At any rate, it incapacitated him.

We have two things to do for this man: He must have the ability to lift his arm restored, either by removing the head of the bone and rounding off the upper extremity of the bone, or freeing the head, placing it back in the glenoid cavity, and nailing it to the neck of the bone.

The skiagrams illustrate the various stages of this trouble. One skiagram shows almost the normal position, showing how misleading a skiagram may be unless more than one is made from different angles. The physical examination did not agree with the skiagram. It showed very distinctly that there was a backward luxation of the head of the bone.

We had a case in which there was fracture of the neck (Figs 21, 22, 23, and 24); the head was luxated below the glenoid cavity. We removed the head, freshened its surface, and put it back in

Fig. 21.—Fracture of the upper extremity of the humerus, with backward and inward rotation of head and upward displacement of shaft. The head was also fractured longitudinally, but the fragments had united. In this picture the larger of the two fragments is in front. The upper edge of the smaller fragment is visible above larger one. Head is also subluxated.

Fig. 22.—In this picture arm is abducted to an acute angle with the body. The head appears to be in the glenoid cavity. Downward and inward rotation is apparent.

Fig. 23.—Arm is held close to side of the body and slightly forward, so that a portion of upper surface of the shaft fragment is visible. Head is rotated downward and backward so that the two fragments are plainly visible. In this skiagram the head appears to be dislocated upward.

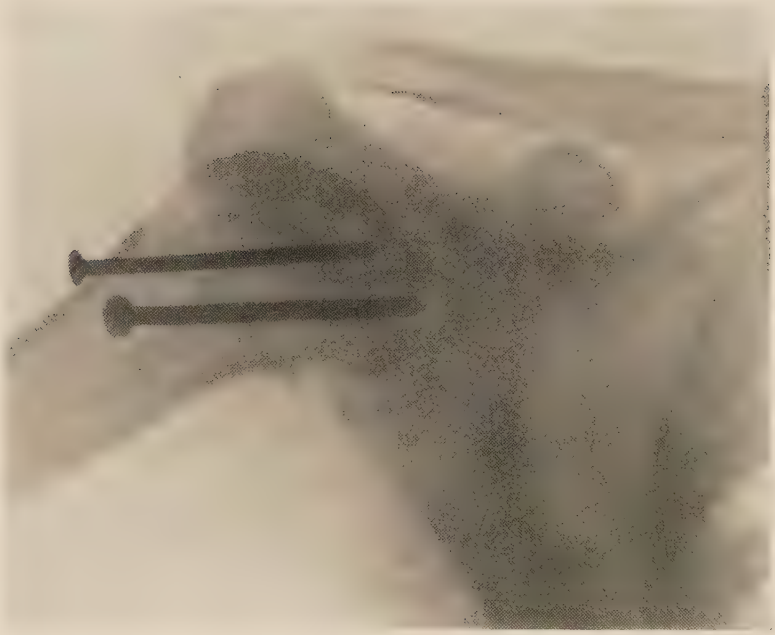

Fig. 24.—The line of fracture is barely visible. The approximation secured by the two wire nails is unusually good. Head of the bone is squarely in glenoid cavity, arm being at right angles to the body. Anatomic result is perfect.

the glenoid cavity, nailing it to the shaft. It filled up with bone and gave us a perfect anatomic and functional result. That is what we may have to do in this case today. The skiagram taken before the operation shows the subluxated head, and one taken after the operation shows the head in its normal position, with the nails in place. Later we removed the nails because they were loosened by absorption of bone around them. The last skiagram shows the final result, a most excellent one.

The head and acromion process in this case appear to be palpable. There also appears to be a considerable callus there at the fractured end of the shaft. That is not going to be an easy operation. How long since this accident?

THE INTERN: Since August 4th.

DR. MURPHY: Since August 4th, just a little over two months ago, so that he has probably a bony union by this time. The upper portion of the shaft is palpable, and in the position shown by the skiagram. It is in front of the head.

In making the incision here to expose the joint I will make the incision parallel to the posterior border of the deltoid muscle on the posterior surface of the shoulder.

Remember, enormously greater care in asepsis must be exercised in doing bone and joint work than in doing work in the abdomen, or you will have infection. The muscle-fibers will be separated, not cut.

Some of the fibers of the muscle are adherent to the fractured end of the shaft, so that they come in between the ends of the bones. The anterior portion of the head is now in plain view. It looks as though it had been split into two unequal parts and then it reunited. The head is rotated entirely out of position. We will separate these two pieces at the line of fracture, because we cannot possibly get this misshapen humeral head back into its normal position and secure a good functional result. There! it separates of itself. The union was not very firm. It is only eight weeks old. We will use the large piece to make a new head. These deltoids paralyze with great ease and do not restore with any kind of rapidity. When this fracture occurred, it threw

the head completely out of the joint. We are in the glenoid space. There is the portion that remained above. We can see where the head belongs—back in here in the glenoid cavity. I can get my finger in, but I cannot replace this head in position without taking it out completely and shaping it. I prefer not to take the head out. Notwithstanding it has repaired you always feel that you know what it does when its vascular supply is retained, even as nature left it. There is the split head.

Now we have things ready. The anterior portion of the head is still in the glenoid cavity. There is the posterior portion of the head. You see it is split. You cannot put these two pieces back. We are going to utilize the half that is in the joint for a new head and dispense with the other half. This will come out entirely. We will nail the retained portion to the shaft. That is our plan of procedure.

Now we want to clean this field out. With a sharp spoon we will take out all this débris of bone that is here, and then I think I will be able to smooth this bone over. As I anticipated when I palpated this bone, a callus has been produced on the end of the shaft fragment, and I must clean that out so that I can rotate the head into position. There is some cicatricial fixation behind here on the capsule. The place in the neck of this bone where this head belongs is easily determined. I have to swing that head clear around to get bone contact. I think I will have to take off a piece of this bone before I can do it. The muscle contraction has been too great to permit us to do otherwise. The head is perfectly free now and we must go back to the original proposition. We will take out the head fragment, freshen the surface, which must contact with the shaft and then replace it in the glenoid cavity. In the case cited above we had to take the head out and replace it in order to secure a normal joint. The glenoid cavity is intact. The fragment of the head which we figured could be used fits well into this cavity. Now we are ready to bring the head and shaft into alinement. The difficulty in restoring this continuity comes from the shortening of the arm muscles. We have replaced the head fragment, and by making strong traction on the arm, we can, by abduction

Fig. 25.—Fracture of the anatomic neck of the humerus, with dislocation of the head of the bone into the subglenoid space. The humerus shadows are retouched with pencil, so as to emphasize the relative position of the head and shaft to each other.

Fig. 26.—Replacement of head of bone into glenoid cavity and fixation of head to shaft by means of a wire nail.

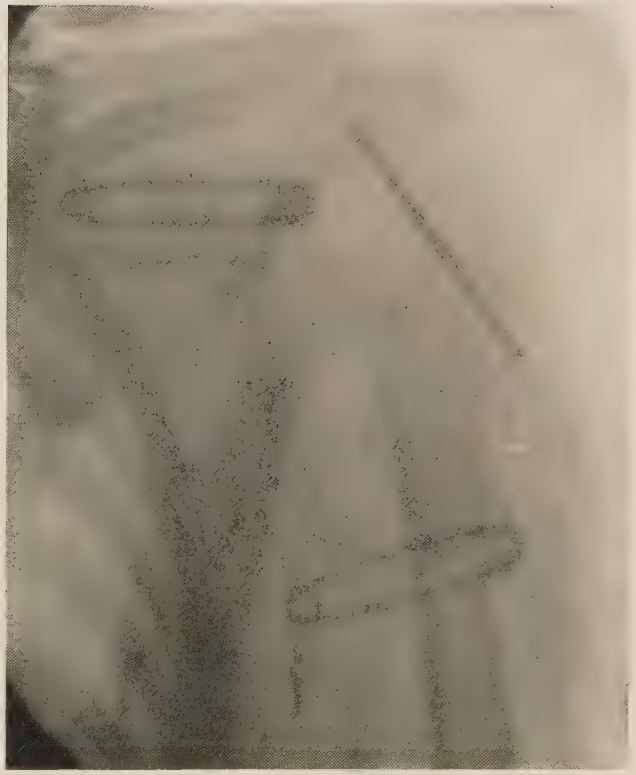

Fig. 27.—Skiagram taken through the plaster-of-Paris cast shortly after the operation. The shadow of the head of the bone is very light and rather indefinite, showing that it was possessed of but little vitality. Comparison with subsequent pictures shows how well the head was regenerated.

Fig. 28.—Four months later. Nail removed, sutures *in situ*, regeneration of bone complete, with return of function in joint.

and inward rotation, bring the head and the shaft into a normal position. Now you can see that the humerus moves as one piece. "*Es bewegt sich wie ein Stück!*" I secure the approximation with two wire nails driven into the head from the external surface of the shaft. The arm is still abducted almost at right angles to the body, and will be kept in that position for six weeks, so that bony union will be sure to take place. That is all we need to do. We close the wound with deep catgut and superficial horsehair sutures, dust it with bismuth subiodid powder, and seal it with collodion gauze. A large 5 per cent. phenol dressing is applied to take up the secretion and prevent saprophytic decomposition of the fluid that escapes.

VISITING SURGEON: Do you put in a drain, doctor?

DR. MURPHY: If you drain this, you ruin your work. These cases are either sterile or infected. Any place where you have separated bone fragments you cannot drain. If the wound is infected, the operation is futile; the result is *nil*, regardless of whether you drain or not. If it is not infected, there is no occasion to use a drain.

The subiodid of bismuth is merely a desiccating powder. It is not antiseptic.

I am steadying this arm very carefully until all this dressing is done. We will put on a plaster-of-Paris cast, which will encircle both shoulders and both arms, enveloping the whole upper part of the trunk. This arm is kept in extreme abduction, with the forearm at right angles to the arm. The other arm is by his side, and will be kept free below the elbow. He will lie in this crucificial cast, so that the operated shoulder will be immobilized completely.

VISITING SURGEON: How about the tension on the brachial plexus, doctor?

DR. MURPHY: I don't think there will be any tension on that at all. There is no constriction anywhere. We will let him use his hand as much as he desires, but his arm and forearm will be out of commission. Plaster is the surgeon's great friend in this work. We will cut this cast in the usual manner, so that it will

not be uncomfortable. Except for the dressing on his shoulder, the cast elsewhere is in contact with the skin.

[The cast was removed four weeks after the operation. The patient had no pain in the shoulder and had joint motion. The cast was replaced. Three weeks later it was removed permanently, and when the patient left the hospital nine weeks after the operation, normal joint motion was being restored rapidly. The skiagram shows a beautiful bony union and regeneration. The nails were not removed.—Ed.]

I want to show you now an arthroplasty we did for an ankylosis of the jaw. [Shows patient.] This boy has had an ankylosis of the jaw since he was seven months old. He is now fifteen. He had an infection in his ear which produced a suppuration in his mandibular articulation, and as a result he had fixation of the jaw. The first time since he was seven months old that he opened his mouth was three weeks ago. We chiseled that ankylosis free, and interposed a flap of the fascia of the temporal muscle to prevent recurrence of the bony union, which was very extensive in this case. We had to remove the coronoid process and a portion of the condyle of the jaw. I had three of these cases in one week, which shows what an opportunity we have for doing something for these patients. [A full description of this case, with illustrations, was given in the December number of the Clinics.—Ed.]

LAMINECTOMY

HISTORY

PATIENT, male, aged twenty-eight, enters hospital on account of paralysis of both legs and inability to extend the forearm.

July 29, 1911, patient dove into a river after taking a running start of 15 feet. The bank of the river was 3 feet above the surface of the water. The depth of the water at this point was 18 inches, and the bottom was hard and packed with sand. Patient struck on left side of head and shoulder, bending the head sharply to the right. Patient did not lose consciousness and attempted to arise, but could move neither arms nor legs. Experienced no pain. Vesical and rectal incontinence began immediately. On the following Monday patient's temperature was 107° F.; the next day, 103.5° F., and continued this high for one week. Immediately following the accident he noticed complete loss of sensation below the shoulders. Twelve days afterward a large bed-sore was found over the sacral region, measuring 4 by 2 inches. This is almost healed now. Last November (1911) had bed-sores on both heels and right hip.

Four months following injury he was troubled with priapism. Six months ago complained of severe burning sensation from hips down; so severe at times that t kept him awake. One year ago he began to have drenching sweats, more pronounced above the hips than below. These sweats stopped one month ago. Last July involuntary flexion of the legs occurred, immediately followed by violent extension, so severe at times that he would have to be held in bed. The arms would be flexed violently and contract on chest-wall. Lost 50 pounds in weight in five months following accident, but has been gaining in past three months.

COMMENTS AND OPERATION

DR. MURPHY: Dr. Mix, will you kindly present the neurologic phases of this case?

DR. MIX: One hot day in July, 1911, the patient went swimming. In attempting to dive, he did not jump out sufficiently far, so that instead of going head first into a hole 10 feet deep, as he intended, he went into a hole only 18 inches deep. He struck on the left side of his head and his left shoulder, and he turned his head sharply to the right. This he distinctly and even vividly remembers, because he did not lose consciousness for a second. Indeed, he said he was not even dazed; but he was instantly paralyzed from the breast-bone down. Moreover, his arms were partially paralyzed. He was catheterized for three weeks after the accident, and he has had bladder and rectal incontinence since. Sensation was lost at once from his shoulders down, involving both arms about equally. In twelve days a very large bed-sore developed over his back, and today, seventeen months later, it is not wholly healed. Other bed-sores developed, one being especially severe over the right hip. The smaller bed-sores have all healed. He had no pain from his bed-sores until three months ago, when he began to feel pain in his back. He has also had a burning sensation in his lower extremities, though he has not a trace of tactile sensation in them.

On physical examination he shows a doubtful Babinski reflex in each great toe, but not a frank Babinski. The knee-jerks are barely present, but traces of a response can be made out in the left quadriceps extensor, and possibly some response in the right. The plantar reflexes were present. The cremasteric, abdominal, and epigastric reflexes were absent. The jaw-jerk was normal. The pupils were equal, of normal outline, and reacted normally to light and in accommodation.

As to motion, there is no voluntary motion in his legs or trunk. He can move his arms with his biceps and triceps, and he can use his shoulder-girdle group of muscles. He cannot, however, flex or extend his fingers, spread them, or bring them

together, or oppose his little finger and thumb. At first he could not move his head, but he regained the ability within two weeks. At present the arm and hand muscles which are involved correspond in innervation to the level of the seventh cervical (slightly) and the eighth cervical and first dorsal segments of the cord. Below this level all the voluntary muscles are paralyzed.

There are two levels of *sensory* loss. First, the epicritical level, the level at which touch is felt as touch, but is recognized by the patient as "felt, but not natural," begins in front, at the junction of the second rib with the sternum, and runs around to meet the third dorsal spine. Secondly, the protopathic level, the level at which the sense of touch is entirely lost, starts at the junction of the fifth rib with the sternum, and runs around to join the fifth dorsal spine behind. This line is not bilaterally symmetric, being about an inch higher on the left than on the right side. Below this line all forms of sensation are lost.

Besides these sensory losses on the trunk there are sensory losses on both forearms and hands, these losses very accurately corresponding to the ulnar nerve distribution; in the fingers, for example, involving the little finger and one-half of the ring finger, and following up the ulnar border of the hand half-way up the forearm. Not only does this area correspond to the supply of the ulnar nerve, but it also corresponds to the sensory supply of the eighth cervical and first dorsal segments of the cord.

A further important point is the fact that the cutaneous territory of the second and third dorsal segments is not involved.

As to contractures, both legs are flexed and drawn up. In the beginning the arms were flexed in this position (indicating, with the arms flexed and the hands brought together, the fingers flexed, over the top of the sternum), which is very characteristic. They are still so flexed in part. Both legs are very stiff, but can be passively extended. The arms can be straightened more easily than the legs.

As to atrophies, all the muscles supplied by the eighth cervical and first dorsal segments of the cord are atrophied, more in the left arm than in the right; that is to say, the interossei, lumbricales, small hand muscles, almost the whole extensor group, and

the ulnar flexors are especially involved. The legs show merely a general atrophy, not selective, and therefore not indicating anterior horn involvement at a particular level.

In this case, then, there are apparently two entirely distinct lesions simultaneously present—one, a cervical lesion involving the eighth cervical and first dorsal segments of the cord, causing the arm symptoms, and the other a crushing injury of the cord at the fourth dorsal segment, caused presumably by a fracture-dislocation of the third dorsal vertebra, which overlies that segment of the cord. And between these two points more or less normal cord seems to lie. I made a diagnosis of a cervical hematomyelia and compression of the spinal cord at about the level of the third dorsal vertebra.

[Shows the *x*-ray plate.] If you will pass around this plate, you can see a fracture-dislocation at that point [indicating], which is at the level of the third dorsal vertebra. If you will examine the cervical vertebræ, you will note that they are perfectly normal. We must infer, then, a crushing injury at the third dorsal vertebra and another sort of injury at the eighth cervical and first dorsal level. What injury could be acquired here as a result of trauma? Evidently, a hematomyelia. In fact, the sort of injury the patient sustained, with the sharp and sudden bending of his head when he struck bottom, would be eminently likely to produce a hematomyelia. Moreover, the position of the patient's arms is highly characteristic—flexed at the elbow and again at the wrist, and the fingers also flexed, and the hands nearly meeting at the top of the sternum. Shall we find blood in the spinal canal now, seventeen months after the accident? Certainly not. There will be present now only a cyst, largely spreading anteriorly, mostly involving the anterior horn cells—spreading the cord, but not absolutely cutting off conducting power.

Interesting is the fact that for a time the patient could not turn his head. We have merely his statement, but it seems to imply a paralysis of his sternocleidomastoids. These are supplied by the spinal portion of the spinal accessory nerve, which springs from a column of cells in the lateral horns of the

cervical cord. Evidently, at first some of these lower-lying cervical cells were involved as a "neighborhood" symptom. In two weeks the head could again be rotated.

We believe, therefore, that this patient is suffering from an injured and compressed cord at the level of the third dorsal vertebra, and from the secondary consequences of an old hematomyelia at the level of the eighth cervical and first dorsal segments.

Dr. Murphy: We will cut down on the spinous processes in the lower cervical and upper dorsal region, and remove them. The incision is made right over the spinous processes. The soft tissues are freed from the vertebræ with a periosteotome.

The spinous processes will have to be entirely removed with bone-cutting forceps, and then we remove the laminæ with rongeur forceps, being very careful not to injure the cord. These operations are very tedious, because we must expose the cord without injuring the dura. Is the fracture at the fourth dorsal vertebra?

Dr. Mix: It is between the third and fourth dorsal vertebræ. The upper level of sensory disturbance comes to the third dorsal vertebra, and the skiagram shows that it is between the third and fourth.

Dr. Murphy: We will remove the laminæ from the fourth dorsal to the seventh cervical vertebra.

Dr. Mix: I want to make a point regarding the sensation. You remember I said that there were two lines of sensation—the epicritical and the protopathic. These were clearly brought out by Dr. Head some years ago, based upon experiments upon his own body. In this man the protopathic line is lower down than usual—it is at the fifth rib in front and the fifth dorsal vertebra behind. The epicritical line of change begins at the sternum in front at the second rib, and runs around the thorax to meet the third dorsal spine. Remember, he feels above the epicritical area, but he does not feel touch as "natural" beneath it, and it therefore marks the level where the trouble lies.

Dr. Murphy: The deviation is at the third dorsal vertebra. I am taking off the spinous process, as you see now, with this

heavy bone-cutting forceps going in just deep enough to clear the dura. In doing this operation it is perfectly justifiable to remove the lamina. The point of pressure is at the third dorsal vertebra. There is a hematomyelia above that point, extending well up into the cord. Now, you see, in a comparatively short time I have the cord exposed. There is the position of the anterior compression opposite the third dorsal. You can see where the cord was traumatized. See the absorption that has taken place. The cord is flattened out. I am going to expose the dura all the way. The cord above is distended and does not pulsate at all. We will open the dura in this case to allow the fluid above this point of compression to flow out. See how it gushes out! It is a flood. The pulsation of the cord is rapidly returning. We will have to prevent the fluid from reforming, and we will do that by drawing out through the cord the wall of the hematomyelic cyst and suturing it to the dura with horsehair. The horsehair will act as a seton and allow continued drainage, so that the cyst will not reform. This is the first time we have performed this particular type of operation. We are convinced that the result will be all we anticipate. The dura wound will be closed with very fine catgut sutures.

One runs an additional risk here because we opened the dura. Dr. Mix, I congratulate you on your diagnosis. I put that seton in because I want to get a permanent drainage. I want this fluid to leak permanently out into the subdural space.

Let the record show that there was a compression of the cord at the third dorsal vertebra, that there was a dilatation of the ependyma from the level of the seventh cervical vertebra down to the third dorsal; that the cord was hematomyelic; that there was a gush of fluid as soon as the dura was opened. There was no pulsation in the cord until the ependymal sac was opened. Let the record also show that the findings concurred with Dr. Mix's diagnosis.

This operation was done on a plan worked out some time ago. This was the first opportunity I had of carrying it out.

The muscles and fascia will be reunited with heavy catgut

sutures, and the skin with silkworm-gut. We will not put in any horsehair sutures. Bismuth subiodid powder, collodion gauze, and a 5 per cent. moist phenol gauze complete the dressing. No drain; no cast; no support of any kind. These patients are very comfortable. They do not suffer any inconvenience or weakness of the spine from the operation, notwithstanding that the spinous processes and laminæ are entirely removed.

[Stitches removed on the fifteenth day; primary healing. On the sixteenth day there was an inability to move the arms, which was maintained for a period of about a week. Since then he has been very well and can move his arms 25 per cent. better than before operation. One week ago he began to have severe and stinging pains in the legs, of which he is conscious. He feels his bed-sore more acutely. No return of tactile sensation, except that he has a conductivity of the pain sense, probably through the gray matter. Bed-sore on back is almost entirely healed. So far as sense of well-being is concerned, he is feeling fine.—Ed.]

CONGENITAL PYLORIC STENOSIS

HISTORY

PATIENT, female, aged twenty-two months, enters hospital on account of continuous vomiting and faulty nutrition. Present trouble dates from August, 1911, when vomiting became very frequent. Mother noticed that when child was two days old it vomited and continued to do so at irregular intervals for several weeks. In August the vomiting occurred two or three times a day, usually three hours after eating. At this time the child was being fed every three hours and mother noticed that immediately before time for feeding patient vomited. No signs of pain accompanied the vomiting and no loss of appetite was noticed. Vomitus was dark brown in color, rancid, and offensive. During September the child vomited only three or four times a week. For past two months has been vomiting twice daily and usually before feeding time. Amount given at each feeding is six to seven ounces of milk; amount vomited is greatly in excess. Mother noticed rumbling sounds in the child's abdomen a short time before vomiting. If child misses a vomiting spell, next period the vomitus is greatly increased in quantity and more offensive. Immediately preceding vomiting child is fretful and any excitement seems to bring on the vomiting. Weighs 13½ pounds; weighed 6 pounds at birth.

COMMENTS AND OPERATION

DR. MURPHY: Dr. Mix, will you please take up the medical phases of the clinical course of this case?

DR. MIX: The baby is twenty-two months old, the only child of its parents. It was not a blue baby; delivery was normal and without instruments at full term. There is no history of previous miscarriages. It was noticed that from the moment

it tried to nurse it was unable to retain its food. It has vomited everything it has eaten from the time of its birth up to the present time, and its mother believes that it never has kept food in its stomach more than a few hours. At first the baby was nursed, then it was bottle-fed. For several months it was treated in a hospital, with some degree of success, but vomiting has never been controlled. Nutrition was so bad at one time that the baby had a very old look, suggestive of the ancient-looking babies with marasmus.

Physical examination was not productive of much in the way of facts. The child is now nearly two years old and yet it weighs only 13½ pounds. Thus it is far from normal in its physical development. The child is quite pale, its lips are slightly blue, and it has an appearance which is suggestive of a mild degree of cachexia. It is not a cross baby; in fact, its good humor is remarkable, when its physical condition is remembered.

Percussion does not show a very large stomach; on the contrary, it is apparently nearly normal in size. The skiagram also indicates that it is fairly normal in development. Possibly the lack of enlargement may be due to the frequent vomiting and its very small feedings. Important, too, and consistent with the absence of demonstrable dilatation, is the fact that no visible gastric peristalsis can be made out. It would seem that the stomach has given up coping with the obstruction at the pylorus. With the stethoscope, too, one misses the squirting gurgle of fluid passing the pylorus. Despite its underdevelopment physically, the child is bright mentally. It is almost uncanny to see a child weighing 13½ pounds saying a few words, trying to talk, and doing baby stunts, such as pointing to its nose, eyes, lips, mouth, and chin when told to do so by its father.

The skiagram shows the vertebræ in the midline. To the left is the shadow cast by the bismuth in the infant's stomach. You will observe that there is no apparent opening toward the right and no apparent development of the pyloric antrum. Undoubtedly there is enough of an opening existing to let some nourishment into the duodenum; otherwise the child would

Fig. 29.—The shadow to the left of the spine is cast by the bismuth mixture in the infant's stomach. Mass appears to be isolated, having no connection whatever with any structure to the right. The duodenal cap is absent. There is no evidence of a pyloric opening.

have died. Such a child cannot grow up, for its resistance is *nil*. The parents have been fully advised of the risk of operation, and are willing to take it. Many cases of congenital pyloric stenosis of moderate degree get well without an operation. But this child weighs only 13½ pounds after nearly two years of existence, and is very anemic. What chance will it have if it acquires one of the ordinary infectious diseases of childhood?

If an opening can be made into the stomach, so that the food can pass out if it, the child will probably get well. Gastro-jejunostomy will probably be the operation that will be done, unless it turns out when the abdomen is opened that some anomaly which we have not recognized is present. The case seems to be, however, one of congenital pyloric stenosis.

Dr. Murphy: Sometimes the condition continues well into adult life. There are several methods of operation to be considered here—the Heineke-Mikulicz pyloroplasty and the Roux gastro-enterostomy. We prefer to do the gastro-enterostomy in these cases on the Roux plan. It depends on how the patient takes the anesthetic whether we will do it. It also depends on what we find.

Doing the operation on the Heineke-Mikulicz plan has not been very satisfactory. It consists in making a transverse incision through the stricture on the anterior wall of the pylorus and then, by suture, convert it into a longitudinal wound. That gives the best result provided the stomach is fairly well dilated. Finney's pyloroplasty practically makes a new pyloric opening, utilizing both the duodenum and the stomach. The incision is made in the wall of the duodenum on the stomach side, and a similar incision in the stomach-wall, each about three inches in length, beginning the incision in the stenosed pylorus. The edges of these incisions are united, as is customary in all stomach and bowel operations. If necessary we could do a gastro-enterostomy later just as easily as we do it in the adult. The objection to this operation is that regurgitation often takes place back into the stomach. The best thing to do is to divide the jejunum four or five inches from its beginning, anastomose the distal end with the stomach-wall, and suture the proximal

end into the side of the jejunum, a few inches from the stomach opening. That is a nice operation if the patient can stand it.

I do not like to operate on little children. This is one of the cases in which I would like to use chloroform, but chloroform is difficult to give, and the mortality from it is high. I recall the case of a little boy on whom I was to operate in my office. He had been told not to eat anything before coming to the office. He was not given any breakfast, but just before he came downtown he went into the kitchen and the cook gave him a big meal of meat. As soon as we began to give him the chloroform he began to get cyanotic. My assistant, the late Dr. Lee, raised him up by the heels and shook him, and out came all the food he had eaten. Only for that he probably would have died and the death would have been charged to the chloroform. It was a case in which we could not have held a postmortem and the father had enough political influence to hold us guilty on the charge of chloroform asphyxiation.

I never got familiar with operating on children, because it has a bad effect on my nervous system. I have seen the late Dr. Gunn, in the pre-anesthesia period of surgery, tie the children in a chair and operate on their palates without an anesthetic just because the child was not big enough to strike him. It just makes me creep now to think about it.

We approach the stomach through the usual incision, going through the right rectus muscle. That gives us a good exposure of the pylorus.

There is the pylorus. It is a firm, hard band. See the ring! There is the ligament of Treitz. When I see that I know just where I am. The transverse colon and omentum are turned up over the epigastrium, and an opening made in the mesocolon at a bloodless area within the loop of the middle colic artery. A fold of the posterior wall of the stomach is drawn through this opening and fastened to the cut edges of the mesocolon with a few tacking catgut sutures, to prevent hernia and constriction of the stomach by cicatricial contraction. A gastro-enterostomy clamp is placed on this fold of stomach and another one catches a loop of jejunum close to its origin. The clamps are laid side

by side and surrounded by gauze pads. With a continuous Lembert suture of Pagenstecher linen the stomach is sutured to the intestine for a distance of about an inch and a half in this case.

Both stomach and intestine are now incised down through the mucous membrane and the edges of the incisions are united all the way round with catgut, the suture passing through all the coats of the stomach and bowel; a Czerny stitch, to give a firm apposition and to stop bleeding.

The clamps are now removed, and the Lembert suture is completed around both bowel and stomach. That makes a firm anastomosis and insures against leakage.

That completes the operation.

Shall we do an entero-enterostomy here? No. I feel that this child has gone through this operation very nicely and any time later we wish we can do an entero-enterostomy. The abdomen will be closed in the usual manner.

Let the record show that there was a very highly developed pyloric stenosis, and that a posterior gastro-enterostomy was done in the usual way; that we left about 5 inches of a jejunal loop for the purpose of some time later doing an entero-enterostomy, if necessary. We can do it without difficulty any time in the life of the child. I think that any improvement that will come to this child as a result of this operation will be almost immediate and great.

Let the record further show that Sister Victorine reports the sponges counted and correct.

There was no blood in the vomitus—just a few shreds. That is where the danger is, in hemorrhage from the stomach. That is why I put in an extra row of stitches.

[Almost immediately after operation the baby retained most of its food, consisting of chicken broth and albumin and later peptonized milk. On the sixth day the baby developed a pneumonia on the right side. Temperature rose to 105.2° F., respirations 50, pulse 160. On the fifth day of the attack the child began to improve. On the twelfth day after the operation its temperature is 99.6° F., pulse 128, respirations 42; child is able

to cough rather vigorously, resists being handled, and shows considerable spunk. For the last five days has been given 3 drams of peptonized milk every half-hour during waking hours, with no vomiting. Food is now being increased to 4 drams every half-hour during waking hours. At first salines were given, but were later discontinued. The absence of vomiting shows clearly that the food is passing through the opening in the stomach into the intestine. The child's stools are normal in amount and yellow in color. She is doing splendidly now.—Ed.]

LAMINECTOMY TWO YEARS AFTER INJURY

HISTORY

MALE, aged twenty-four, plasterer, comes to the hospital because of paralysis of both legs and loss of control of vesical and rectal sphincters. Tuesday, October 10, 1910, while at work, he fell a distance of about 18 feet, and while falling, his back struck on a projecting body. He landed on a cement floor, but does not know in what position he was when he struck the floor. When picked up he was unconscious. When he regained consciousness, after a few moments, he had a severe pain in his back, in the lower lumbar region. This pain has been present ever since the accident, and is worse at some times than at others. The patient cannot move his lower limbs, and he has no sensation in them. Since the accident he has not been able to urinate voluntarily, and he has had involuntary bowel movements.

Physical Examination.—Complete paralysis below the level of the first lumbar vertebra. No zone of hyperesthesia above the level of the lesion. Loss of sphincteric control of the bowels, with inability to urinate. Complete abolition of all the reflexes of the lower extremity and also of the cremasteric. Faradic response fair in right lower extremity, feeble in left, showing that the axones are alive.

COMMENTS AND OPERATION

DR. MURPHY: I will ask Dr. Mix to take up the analysis of the case from the neurologist's standpoint.

DR. MIX: We must first examine the reflexes. As to the *tendon-reflexes:* the left patellar is absent; the right is reduced, but is present; the Achilles jerks are both absent. Thus, then, on the left side of the body the tendon-reflexes are absent, whereas on the right side they are present, but excessively reduced. As to the *superficial reflexes:* both the epigastric and

abdominal are bilaterally present; both plantar reflexes are present, but the left is better than the right. As to *pathologic reflexes:* the Babinski toe-phenomenon is present on the left side, but not on the right; the left-sided Babinski is very peculiar in this respect: pressure in the groin, at the origin of the gracilis and of the adductors longus and brevis, elicits the Babinski reflex. Though extension of the great toe can be called for in many ways, I have never known of a case personally, or in medical literature, where compression of the origins of the adductor muscles against the pubis called for the toe-phenomenon.

The only vasomotor phenomenon of interest is a very pronounced dermatographia, equally intense on both sides of the trunk.

Sensory Disturbances.—The muscle- and joint-sense is completely lost in both legs, for all muscles. The tactile sense is entirely absent, yet touch can be felt as an increase in the burning which is subjectively present in the legs. In other words, when he is touched, he becomes aware of it by reason of his perception of an increase in the burning which is always present. This would indicate that he has some conductivity of sensory impressions, and I strongly suspect that these burning sensations are conducted upward through the gray matter of the cord.

In cases of transverse myelitis and transverse injuries of the cord the limitations of the sense of touch mark the level of the lesion. In looking for these limitations attention must be paid to epicritical and protopathic sensibilities. Protopathic touch is primary tactile sensation—a mere perception of touch. Epicritical sensibility to touch is something more than mere primary tactile sensation: it is an apperception rather than a perception. Memory and judgment enter into its composition. Now, in transverse lesions the epicritical faculty is lost at a higher level than the protopathic; and the epicritical loss of tactile sensation usually marks the level of the lesion very accurately. In testing protopathic sensation you say to your patient: "Do you feel?" In testing epicritical sensation you say: "I know you feel this, but does it feel *natural?*"

In this particular case, on testing sensation we find tactile

sensation beginning to seem "unnatural" along the supply of the ilio-inguinal and iliohypogastric nerves. These nerves spring from the first lumbar segment of the cord, which segment lies opposite the twelfth dorsal vertebra. Therefore the lesion lies at this level.

Testing further, we find protopathic sensibility present on the thigh beneath the groin, in the genitocrural territory, but when we get into the anterior crural territory, all tactile sensation is lost. If we depended on an absolute tactile anesthesia for our localization, we should place the lesion opposite the first lumbar vertebra, and we should err.

As to *motor* losses: We find a very slight degree of motion in the right leg from the hip, mostly in the quadriceps extensor, but on examination we find it is an involuntary associated movement. When he tries to lift the leg, this slight motion takes place. He also has involuntary extension movements in the left big toe, this being merely an involuntary, self-excited, Babinski toe-sign. He has told us that when his penis is erect he can move it, but we have not tested this statement. In general, aside from some involuntary movements and pathologic reflexes, all motion is lost below the first lumbar segment of the cord.

Some *atrophy* is apparent in the right leg, for it is surely smaller than the left. We find that the loss is in the anterior tibial group and in the quadriceps extensor. In general, however, there is little or no atrophy and little or no selective atrophy; neither is there any fibrillary twitching.

Contractures are not present. There is some stiffness in the legs, but only a very little.

As to *faradism:* I got responses in the muscles of his right lower extremity, but in the left leg the responses were feeble, slow, and very deliberate. The fact of response at all is of vital importance.

The conclusion is that the patient has a crushing injury of the cord, affecting the first lumbar segment, caused by a fracture-dislocation of the twelfth dorsal vertebra. It may seem like splitting hairs, but the line of force seems to run from the left posterior to the right anterior portion of the cord, indicating that

the squeeze came from the left front of the body, pressing backward and to the right, or that posteriorly the right lamina is pressing forward and to the left. The predominating lesion is on the left side of the cord, because: (1) The Babinski toe-sign is on the left side; (2) the knee-jerk is lost on the left side; (3) the faradic response is less on the left side; (4) the involuntary motion from the irritative lesion is mostly on the left side. It is likely that an operation will give some improvement, but the amount of improvement cannot be foretold. The cord is not severed.

Dr. Murphy: That gives you the presentation of the case from the neurologist's standpoint. In the presentation of the case from the surgical standpoint, what we want to know is whether or not the cord is severed, and whether or not the removal of the pressure on the cord will give a restoration of function. We know that in a transverse pressure myelitis, if the nerves or the spinal cord are compressed, the result is an inflammatory reaction—edema, swelling, infiltration, and suspension of transmission. I recall a case I had in 1886. The man fell from a scaffold some 12 feet high, landing on his buttocks. He worked that day and he worked the next day. In thirty-three days he had a complete paraplegia—a paralysis of the legs and a paralysis of the sphincter of the bladder. He had no deformity of the spine, no evidence that the spine had been compressed, but he had no faradic reaction and complete suspension of transmission of motor impulses. He was not operated on,—just treated with rest and tonics,—and in fourteen months he was back at his work with a complete restoration of function in all the muscles. I cite this as an evidence of complete restoration of motor function after suspension of transmission.

In regard to injuries of the spine, cases have been reported by Harte, of Philadelphia, and Fowler, of Boston, of division of the spinal cord with a complete restoration of function. However, when the histories of these cases were analyzed and the symptoms were analyzed, it was evident that they were not cases of complete division of the cord—only partial division of the cord (in Harte's case). A severe injury to the spinal cord does not always

produce a complete division of the cord, as reported by Fowler. His case shows exactly the same variance in the examination and the analysis of the symptoms as does Harte's.

In the true cord there are none of the conditions present for regeneration, because the axones are without a neurilemma. When the axone is cut in the true spinal cord, it never regenerates. Of recent years we have had two distinct classes of results in the treatment of divisions of peripheral nerves. If we unite the nerves without the intervention of connective tissue and with axonal contacting and got complete regeneration; if we unite the nerves with their bulb ends retained, we do not get a regeneration, because these ends are covered with connective tissue, which prevents axonal contacting. The men who unite the nerves without the interposition of connective tissue between the cut ends of the nerves had regeneration of the axones and complete restoration of function, and the men who suture the nerves with the connective tissue interposed secured no more return of function than if they had sutured two pieces of cheese together, because the axone could not pass through the interposed connective tissue. The nerves of special sense have no neurilemma and are therefore incapable of regenerating themselves.

Now, then, that is all you really have to keep in mind from a surgical standpoint. The factor in injuries of the spinal cord which is of such importance in making a differential diagnosis is whether the nerves are divided or whether there is only suspension of transmission. It is our duty to relieve these nerves of the pressure on them. Many times the patient has an immediate and complete and annular paralysis of motion and sensation on the same level for the entire circumference of the body.

Regarding the technic of the operation, the first question is, Can we remove the spinous processes and with these the laminæ? and the next question is, Can we remove the spinous process and leave the laminæ? If we remove these structures, does it impair the strength of the spinal column in any way? It is a well-known fact that one can remove the laminæ and spinous processes without doing injury to the column. It simplifies the operative procedure to remove the laminæ and the spinous processes, and

one can remove them readily in the majority of cases and without detriment to the patient or traumatizing the cord.

This man has some lateral luxation of his spine at the twelfth dorsal vertebra. We will remove the spinous processes of the tenth, eleventh, and twelfth dorsal and the first and second lumbar vertebræ.

We will make a longitudinal incision directly over the spinous processes of the last three dorsal and upper two lumbar vertebræ, the patient lying partly on his left side and partly on his chest, and the right leg being drawn up in extreme flexion so as to stiffen his body and to throw his spinal column backward, thus making it more accessible for our work. The incision extends down to the vertebræ. The soft tissues on either side of the spinal column are then retracted, so that the spinous processes can be removed with a heavy bone-cutting forceps. We will remove the spinous processes of the tenth, eleventh, and twelfth dorsal vertebræ down to the level of the laminæ. We find that it is the eleventh dorsal vertebra that is particularly involved, and that it is here that the spine is angulated, the tip of the angle being directly backward. The eleventh dorsal vertebra is also luxated backward. With the rongeur forceps we will very carefully remove the laminæ of the tenth, eleventh, and twelfth dorsal vertebræ, so that the spinal cord will be exposed freely. There is not much bleeding, most of it coming from the bone. This we can very easily check by putting in a little Horsley wax, pressing it firmly against the bone. This wax is also useful to cover over the sharp edges which might cut the dura. The backward curve in the spine is not very evident, its highest point being opposite the eleventh dorsal vertebra. The dura is very much thickened by the development of fibrous tissue, and we shall endeavor to remove some of the ragged edges with the scissors. Of course, we do not want to penetrate the dura, because if we did, we would have the additional danger of infection of the spinal canal.

The cord is not pulsating above and below the luxated vertebra, and as we remove more laminæ we find that the tension of the cord gradually is disappearing and the pulsation is again becoming evident in this area. There was, therefore, in this case

not a complete division of the cord—merely a compression which we have to relieve in this manner if the patient is to regain any use of his paralyzed extremities.

We have now relieved the cord of this pressure, excised the redundant connective tissue, and the next step is to close the wound.

It is not necessary to cover over the spinal cord here with any foreign bony material, because of the heavy pad of muscles normally present, which is sufficient protection against injury, and during the process of repair the patient wears a leather jacket to prevent flexion of the column. We will suture the muscles with silkworm-gut, suturing them well over the spinal cord. The sutures will also include the skin. Bismuth subiodid and collodion gauze seal the wound. Over this we will place a very large dressing, which will be held in place by a roller bandage encircling the patient's body. There is no further dressing needed to protect the patient's back.

We perform all our laminectomies in this manner, and our results have always been very satisfactory, both to the patient and to ourselves.

VISITING DOCTOR: What is the prognosis?

DR. MURPHY: The prognosis is that he will have a very material improvement.

VISITING DOCTOR: If the operation had been performed immediately after the injury, what would have been the result?

DR. MURPHY: The patient would have been in his grave long ago. He had trophic sores. When these are present, the cases do not do well under immediate operation. His trophic conditions are splendid now. His sores are all healed up.

VISITING DOCTOR: Many surgeons consider it advisable to open the bladder for vesical drainage after such an injury—what do you think of that?

DR. MURPHY: That is the next best thing to not doing anything. It does not do any good. I never open the bladder. We put the patient to bed, then we pad his popliteal space, pad his spine under the small of the back, and that takes the pressure off the high points and prevents a sacral skin necrosis. The first

place these patients get a necrosis is over the sacral region, and the next place is over the heels. We put pillows under the heels and prevent a necrosis there. These patients more commonly die from infection of the bladder and ascending infection into the kidneys—they rarely die from the fracture of the spine. We avoid necrosis by an equalization of the pressure and by frequent changes of position. If you will wait until the bladder fills, you will find that it will empty itself of its own accord. You will be surprised how little trouble there is in the first few days, if you just wait until the bladder has the urine under high tension. You can stimulate the voiding of the urine by gently massaging the prostate. It is only a question of time in the management of these cases. If you open the bladder, you are very liable to get an infection from the outside from which the patient will die. *We never catheterize these patients.*

We will keep this man on his side for the next few hours and then we will turn him over on his back.

Let the record show that there was a fracture of the lamina of the first lumbar vertebra, with an inward luxation of the edge of the lamina and a pressure on the cord at this point.

Let the record further show that the spinous processes and laminæ of the last three dorsal vertebræ were removed and that the mass of connective tissue which rested over the dura was carefully dissected out; that the cord was freed; that the dura was not opened, so that there is practically no danger whatever of an infection of the spinal cord. [Primary union. Left hospital in four weeks. No material change in nervous symptoms. Has not been heard from since.—Ed.]

HOUR-GLASS STOMACH

DR. MURPHY: Dr. Mix has a very interesting case about which he wishes to talk to you this morning and show you some fine *x*-ray plates.

DR. MIX: This man, fifty-nine years of age, referred to me for diagnosis by Dr. Pelton, of Elgin, Ill., has had pain for twelve years in the left gastric region. He complains of pain and nothing more. He says he has "lived with it" twelve years, but hates to contemplate passing the remainder of his days in its company. The pain came on two or three hours after eating. It was relieved when the stomach was full, and relieved most after a very hearty meal, but the taking of small quantities of food caused no relief of the pain. Were the case a duodenal ulcer, we might have a history of pain two or three hours after meals, but the pain would ordinarily be relieved by a little food, and it would be a diffuse pain, to the right of the midline, in that area a little to the right of and above the navel, which some day we are going to call the *duodenal area*. The pain, however, was *left-sided*—in the gastric area.

Such a pain might be referable to the pylorus, but if it were an ulcus, we should expect something more of a history than twelve years of daily pain. A pyloric spasm due to any visceral cause could scarcely have so persistent a course.

Physical examination was negative. The stomach was not specially large, and was in a location within the normal range of variation. Visible gastric peristalsis could not be demonstrated. On passing a tube several hours after eating I abstracted some stomach-contents, showing that there was food retention. Apparently the stomach-tube went in the normal distance. A test-meal showed absent hydrochloric acid and the presence of lactic acid, but there were no Oppler-Boas bacilli to be found, and

blood was not present, either microscopically or by the chemical test, neither was occult blood in the feces. A motor meal showed a small residuum after five hours.

The conclusion seemed inevitable that there was food-block somewhere. Evidently the duodenum was not at fault symptomatically or by physical examination. The pylorus was apparently patent, and certainly was not sore. The food-block and the pain under the left border of the ribs suggested to me a possible block in the stomach itself, and hence the possibility of an hour-glass stomach occurred to me. In the old days, for our diagnosis of this condition we were dependent upon the abstraction of stomach-contents from two pouches with two differing acidities, or of outlining with dilatation of the stomach two bulging pouches with a constricted portion between. Now all we need to do is to make careful *x*-ray pictures, with our minds on the pathologic condition we are after. Hence I had three pictures taken, and here they are.

[Shows *x*-ray plates of stomach.]

The first picture (Fig. 30) was made five minutes after the ingestion of 16 ounces of buttermilk containing 2 ounces of bismuth subcarbonate. It definitely shows a shadow across the gastric area. [If this plate is contrasted with the *x*-ray plates elsewhere in this volume showing the full stomach, the shadow will be immediately apparent.—Ed.] The second plate (Fig. 31), made fifteen minutes after the first, shows the food passing from the first half of the stomach into the second half. The third picture (Fig. 32) shows the condition two hours after the bismuth was given. It is very clearly a constricted stomach—an hour-glass stomach.

In this case the correct diagnosis before the plates were made was had in mind, because it was appreciated that there was food-blockade with gastric peristaltic cramp not due to duodenal block or ulcer, and not due to pyloric spasm or blockade; the *x*-ray pictures were then ordered, with some confidence as to what they might disclose.

What caused this form? Probably a round ulcer some twelve years ago. There is no evidence of malignancy; no special

Fig. 30.—Skiagram made five minutes after the ingestion of 16 ounces of buttermilk containing 2 ounces of bismuth subcarbonate. It definitely shows a shadow across the gastric area.

Fig. 31.—Skiagram made fifteen minutes after Fig. 30, showing the food passing from the first half of the stomach into the second half.

Fig. 32.—Skiagram showing the condition two hours after the bismuth was given. It shows clearly the constricted stomach—an hour-glass stomach.

emaciation, though the patient is rather spare in build and has been clearly under weight for years; no cachexia; no special anemia, his blood examination showing 80 per cent. hemoglobin and about 4,500,000 red blood-corpuscles per c.mm. Carcinoma and ulcer are the usual causes of the acquired form of hour-glass constriction. No proper history of ulcus exists in this case, it is true, but exact information as to the details of the symptoms of onset is necessarily lacking, the memory of daily pain for twelve years blotting out the memory of the pain at its onset.

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